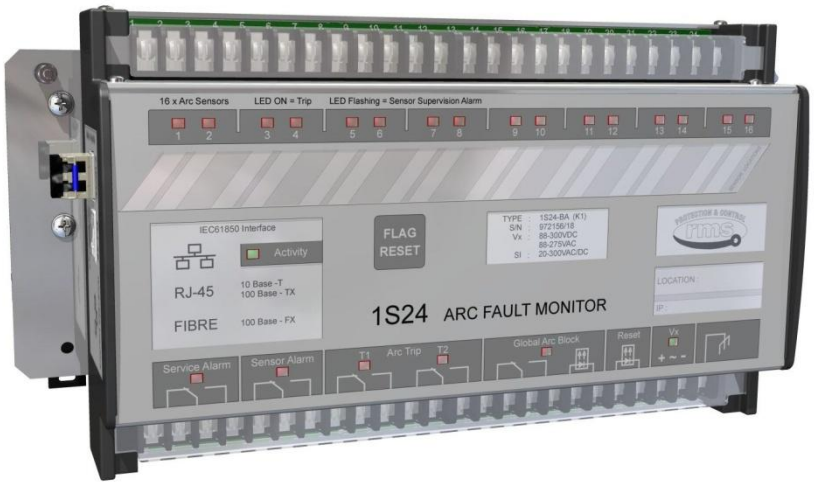
1S24 User Guide

Arc Fault Monitoring System

relay monitoring systems pty ltd

Advanced Protection Devices



User Guide

NCS INTERNATIONAL CERTIFIED QUALITY MANAGEMENT SYSTEM ISO9001

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1S24 User Guide

About This Manual

This User Guide covers all 1S24 relays manufactured from February 2013. Earlier relays do not necessarily incorporate all the features described. Our policy of continuous development means that extra features & functionality may have been added.

The 1S24 User Guide is designed as a generic document to describe the common operating parameters for all relays built on this platform. Some relay applications are described but for specific model information the individual "K" number Product / Test manuals should be consulted.

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To download a PDF version of this guide:
http://www.rmspl.com.au/userguide/1S24_user_guide.pdf

To download the model specific Product Test Manual:
http://www.rmspl.com.au/search.asp

Part

1

How this Guide is Organised

This guide is divided into four parts:

Part 1	Overview
Part 2	Documentation
Part 3	Application
Part 4	Commissioning

Part

2

Documentation

Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the 1S24 are described in the product Technical Bulletin. For the most up to date version go to:

www.rmspl.com.au/handbook/1S24.pdf

www.rmspl.com.au/handbook/1s30.pdf

The order of precedence for product information is as follows:

- Product Test Manual (PTM)
- Technical Bulletin
- User Guide

User Guide

This User Guide covers all 1S24 relay versions & describes the generic features & attributes common across all versions.

Different relay versions are required to cater for varying customer requirements such as auxiliary voltage range, I/O configuration, case style, relay functionality etc.

The product ordering code described in the Technical Bulletin is used to generate a unique version of the relay specification & is called a Type Number. This code takes the form 1S24Kxx where the Kxx is the "K" or version number. For a complete description of the RMS "K" number system refer to: *www.rmspl.com.au/handbook/parta3.pdf*

Product Test Manual

Each 1S24 version has a specific PTM which provides details on the unique attributes of the relay. Each PTM includes the following information:

- Specific technical variations from the standard model if applicable
- Wiring diagram

If you require a copy of the PTM for an RMS product the following options are available:

- Check the RMS web site at: *www.rmspl.com.au/search.asp*
- RMS CD catalogue select: *List all Product/Test Manuals* under *Technical Library*
- Contact RMS or a representative & request a hard copy or PDF by email.

Part 3

Application

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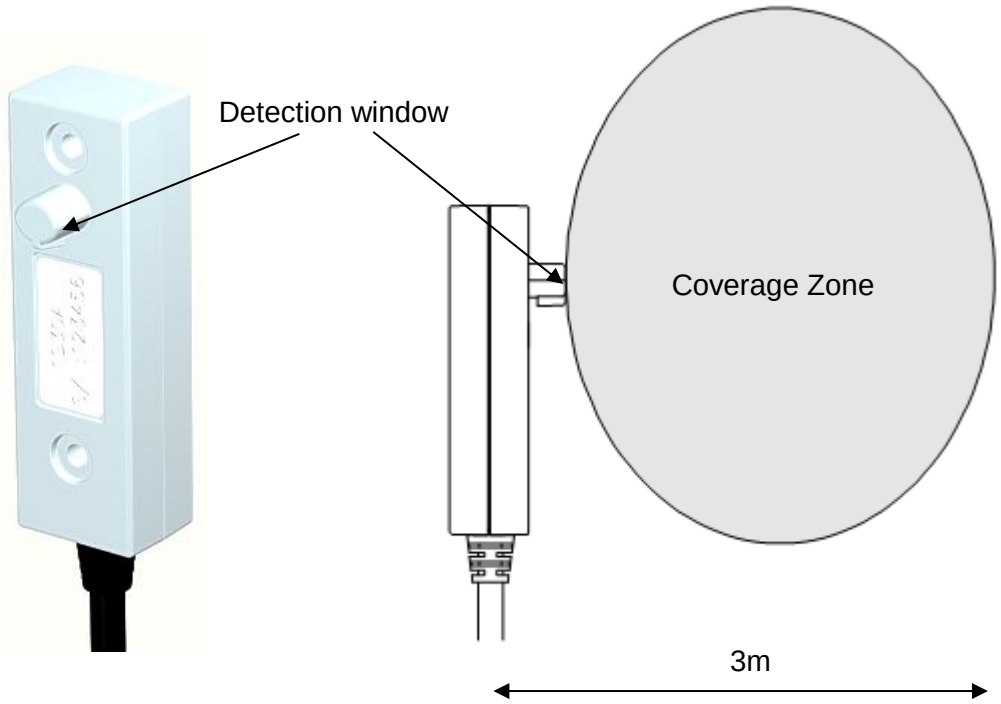
Sensor Installation

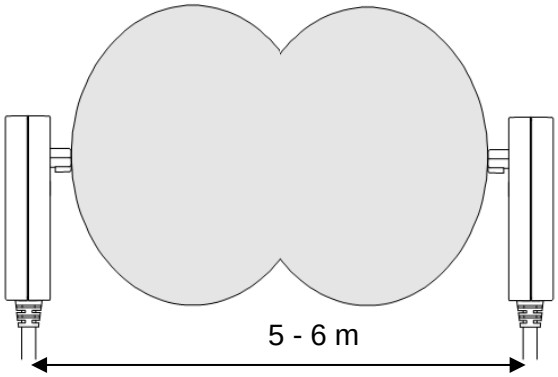
Sensor Spacing

The 1S30 sensor is available as a single detector or dual detector package.

The 1S30A single detector version is depicted below showing the location of the detection window and the approximate coverage zone :



The recommended spacing for the 1S30A single detectors is approximately 5 - 6 m to ensure adequate detection overlap.



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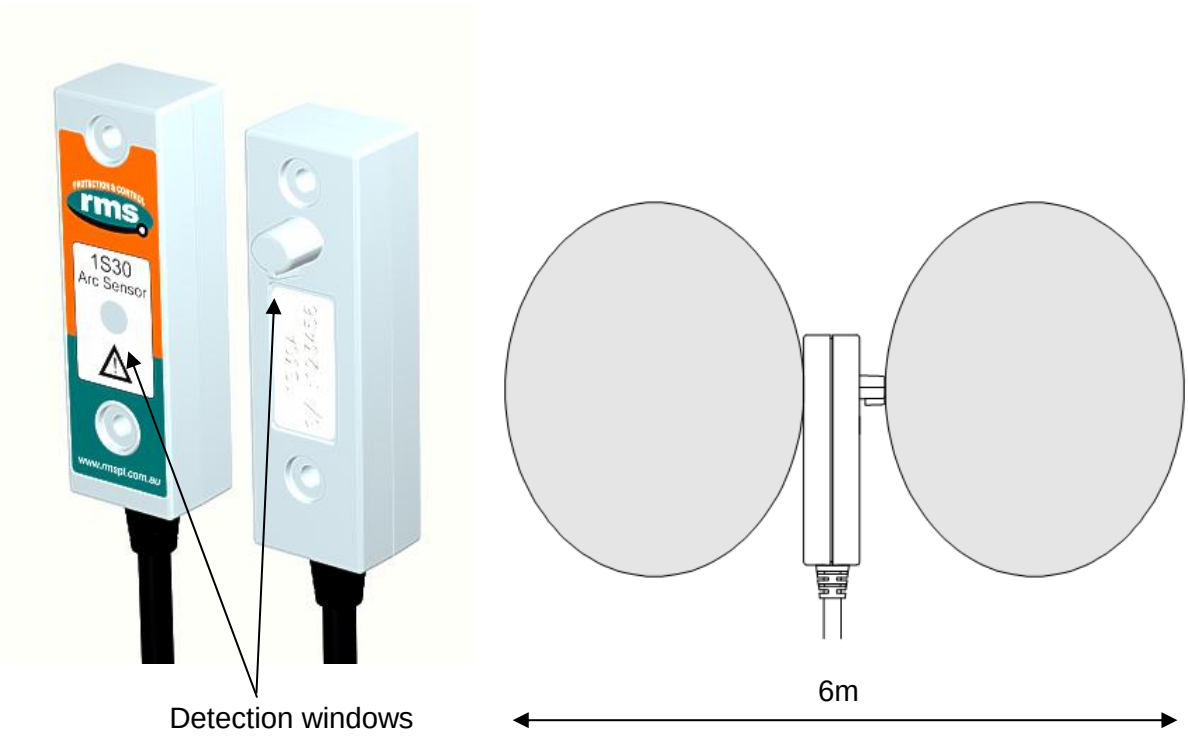
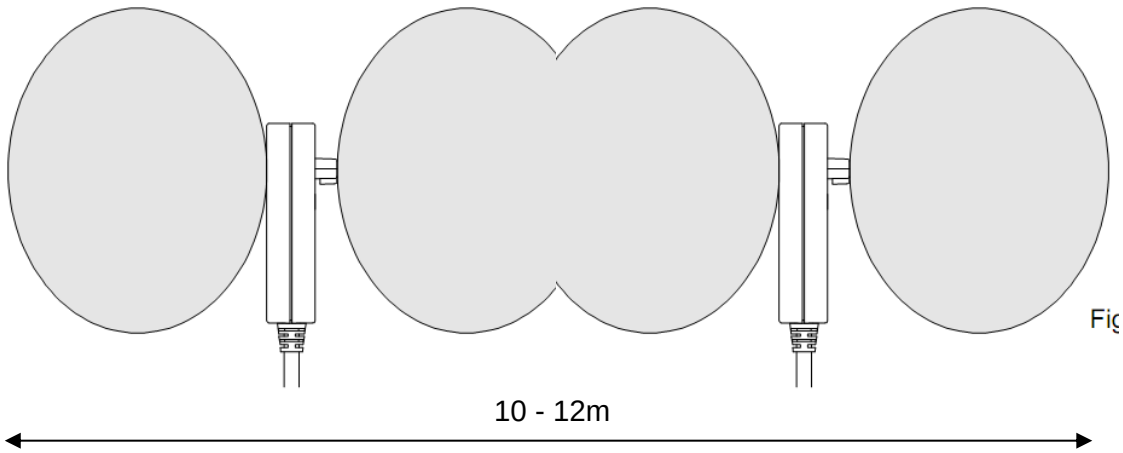
The 1S30B Dual detector version provides an additional detection window for dual zones of coverage as depicted below :



The recommended spacing for the 1S30B single detectors is approximately 5 - 6 m to ensure adequate detection overlap, this combination provides an overall coverage zone of approximately 10 - 12 m.



Fig

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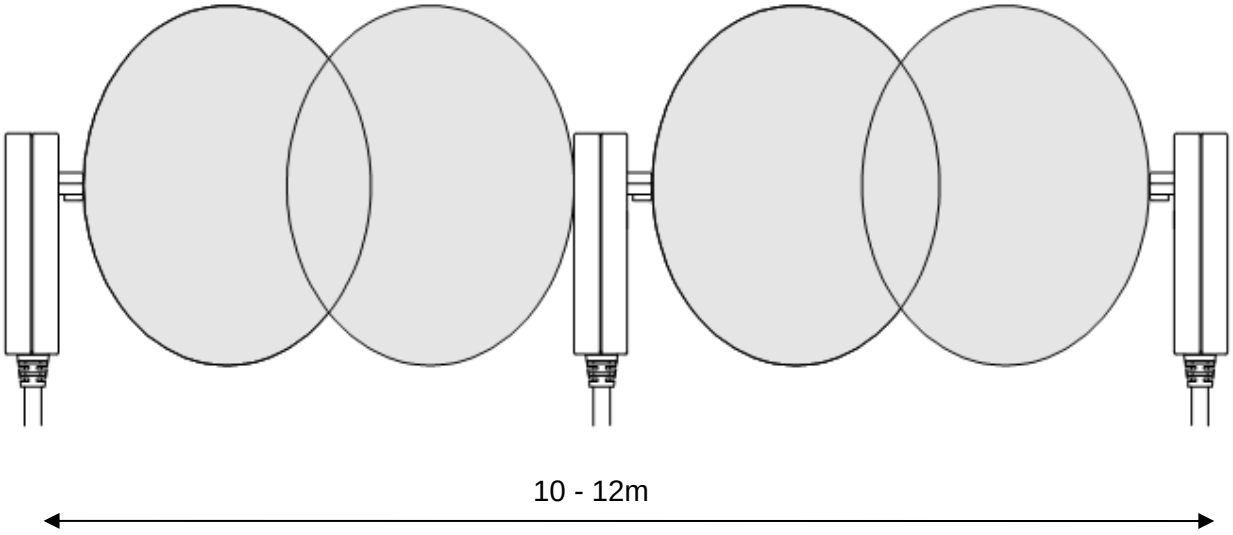
The 1S30A and 1S30B sensors may also be mixed to provide various coverage combinations, again spacings of approximately 5 - 6 m should be observed to ensure adequate detection overlap.



Sensor Placement

Sensors need to be mounted to provide full coverage of the switchgear cubicles to be protected. Where the protected zone is larger than the sensor coverage then the use of multiple sensors is required.

Precise positioning of the sensors is generally not required as the light caused by the arc is reflected from the walls.

Sensor Mounting

The 1S30 is suitable for flush panel mounting in a number of configurations, for further information on mounting arrangements and mounting hardware refer to the 1S30 Technical Bulletin.

Example Sensor Placement

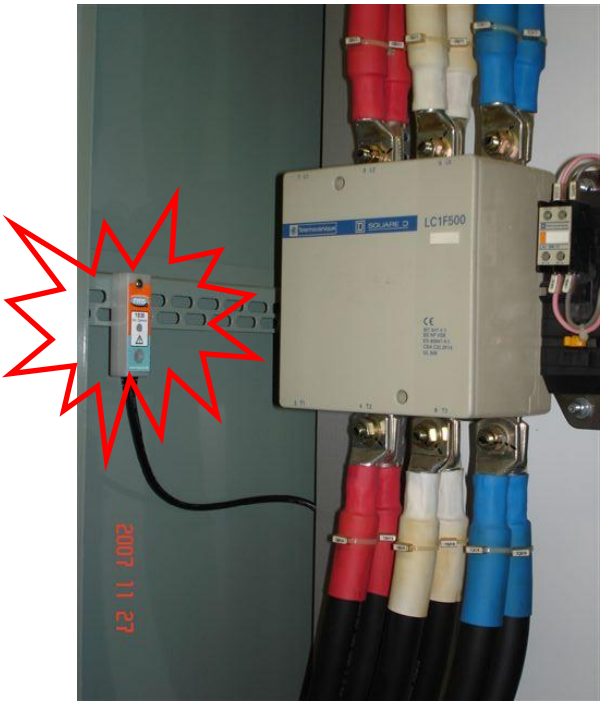
The following are some typical examples of sensor placement.

Sensor placement inside CB racking chamber

Sensor placement inside busbar chamber

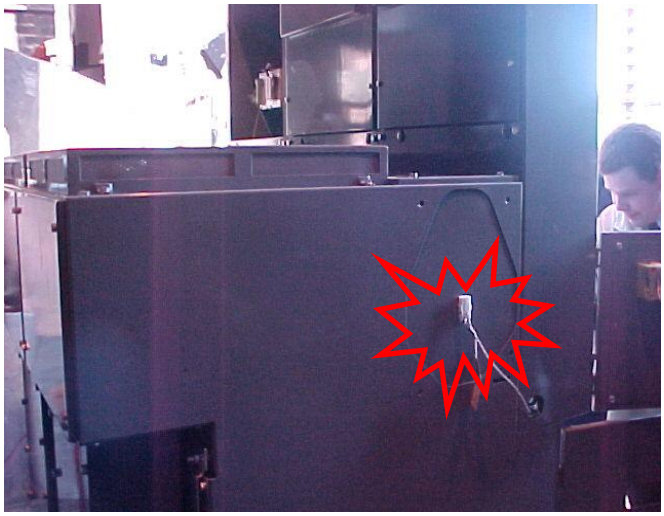
Sensor placement inside cable termination chamber

Sensor placement for switchgear Busbar coverage (External through Hole Detector)



Sensor placement near Low Voltage Contactor for a Variable Speed Drive

Sensor placement for Switchgear cable termination chamber (External through Hole Detector)

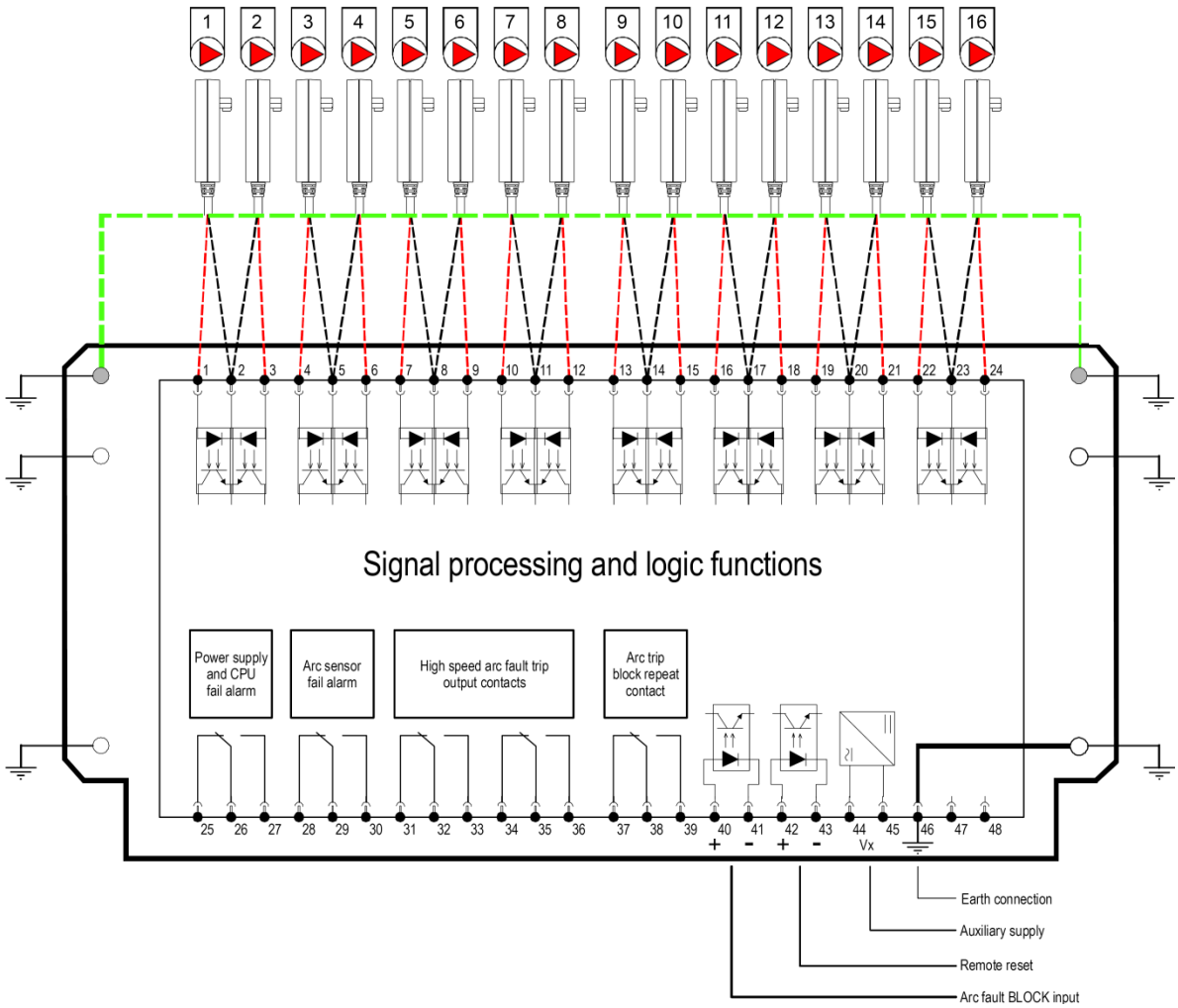


Sensor placement for end of Bus chamber (External through Hole Detector)

Sensor placement for Switchgear cable termination chamber (External through Hole Detector)

Scheme Wiring

1S24 Connection diagram


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Signal processing and logic functions
Power supply and CPU fail alarm
Arc sensor fail alarm
High speed arc fault trip output contacts
Arc trip block repeat contact
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
+ - + - Vx
Earth connection
Auxiliary supply
Remote reset
Arc fault BLOCK input

The above diagram shows the 1S24 connections.

The connected sensor inputs need to be enabled and unused inputs disabled via the Web browser configuration tool. This is essential to :

- Allow connected sensor inputs to operate for an ARC Fault
- Allow connected sensor inputs to be supervised
- Ensure unconnected sensor inputs do not indicate an Arc sensor Alarm condition

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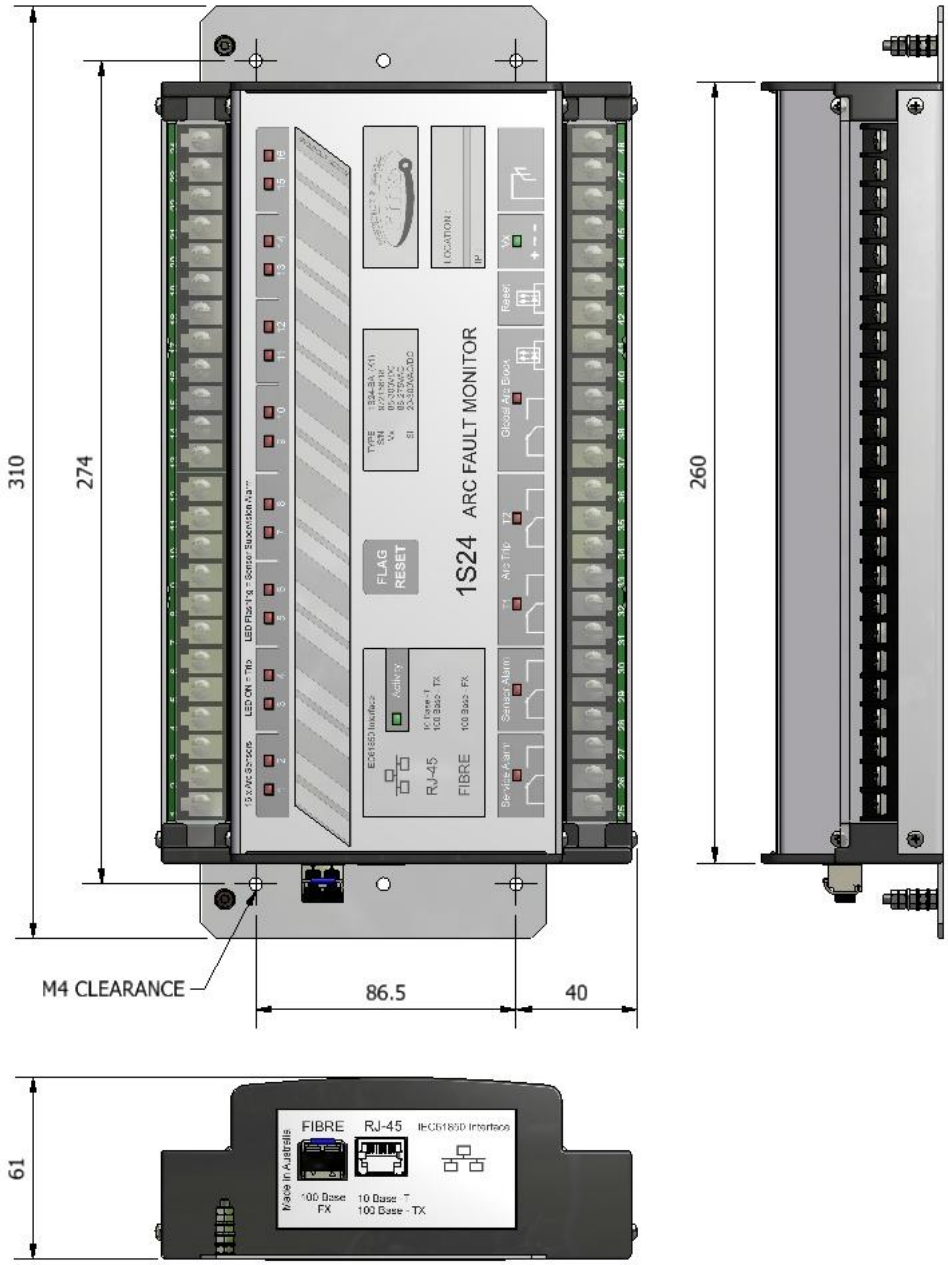
Terminal Layout and Module Dimensions



The module may be surface mounted or alternatively mounted on a din rail by using 2 optional din rail mounting kits (2 x RMS P/N: 290407157).

Refer to the 1S24 Technical Bulletin for complete installation details.

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Custom Labels

The 1S24 front panel makes provision for two (2) custom labels, one label identifies the sensor location and the remaining label provides IED identification and IP address details.

The default labels supplied with the relay may be marked up by hand or alternatively custom labels may be produced using the template provided on the RMS website, printed and slipped behind the clear windows on the front panel as depicted below.

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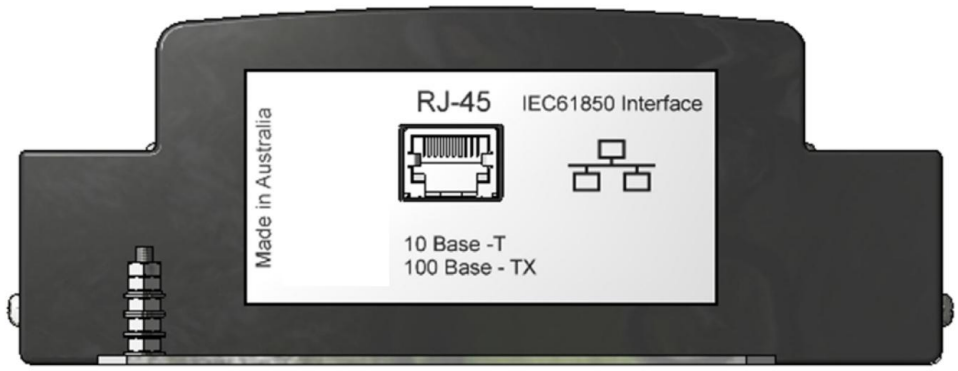
Communications

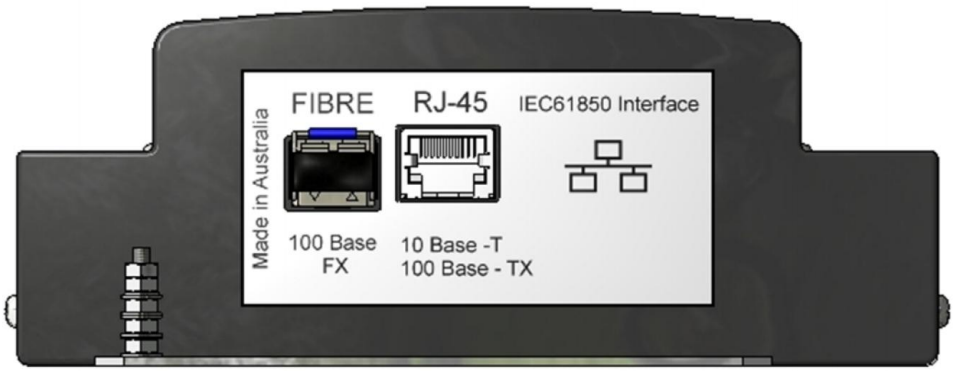
Physical Connections

The 1S24 is ordered with either of the following Ethernet connection options :



Standard Single Port : RJ45 10Base-T / 100Base-TX

In the single port option the RJ45 port is utilised for connection to an IEC61850 station bus LAN for Goose messaging purposes and for device configuration.



Optional Two Port : RJ45 10Base-T / 100Base-TX and
Fibre 100Base-TX

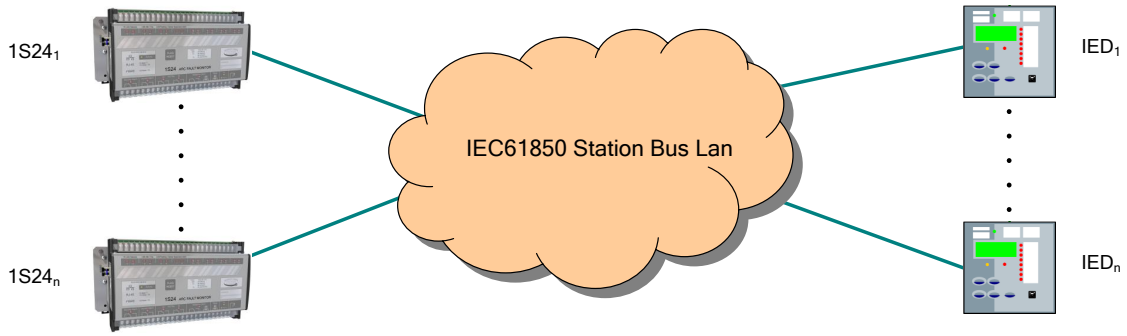
The two port option allows one of the ports to connect to an IEC61850 station bus LAN for Goose messaging purposes and either port may be utilised for device configuration.

IEC61850 Communication Topologies

The 1S24 IED employs IEC61850 Goose messaging to convey the operation of ARC Fault Sensors and may be used with one or many subscribing IEDs to deploy ARC Fault protection schemes.

The simplest application topology is to connect a single 1S24 directly with a single IED using a suitable crossover connection :

Alternatively the 1S24 or many 1S24 Arc Fault Monitors may be connected to a Station Bus Lan as shown below :



The Station Bus Lan may be arranged using many different topologies, discussion of the various Lan topologies is beyond the scope of this user guide.

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IP Addressing

The 1S24 IED will come preconfigured from the factory with the IP address 192.168.0.220. The default IP address may be used in a web browser session to undertake relay configuration. Full details of relay configuration are described in subsequent sections of the user guide.

Reconfiguration of the 1S24 IP address may be required according to the IP addressing defined in the IEC61850 substation configuration, any subsequent web browser sessions will need to utilise the reconfigured IP address.

1S24 Arc Fault Monitor Configuration

Web Browser Session

Configuration of a 1S24 can be undertaken either via direct connection to a PC or via a Lan.

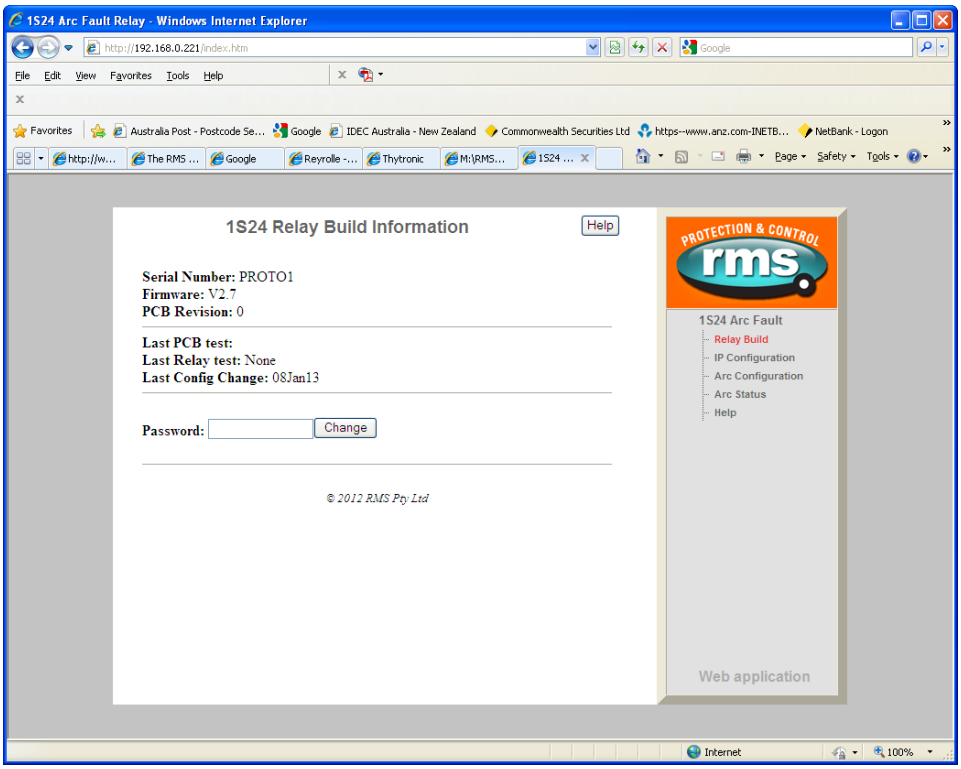
If a direct connection to a PC is utilitised a crossover patch lead will be required to enable communication with the 1S24.

Whether the communication is direct or via a Lan, both the PC and the 1S24 need to have IP addressing within the same network.

With a subnet mask of 255.255.255.0 the first 3 octets of the IP address need to be the same for the PC and the 1S24 and the last octet needs to be unique, for example :

1S24 IP Address : 192.168.0.221
PC IP Address : 192.168.0.238

In the above example entering the 1S24 IP Address (192.168.0.221) into the PC web browser address field will establish a web browser session displaying the Relay Build Information and a menu tree to navigate to the other configuration screens.



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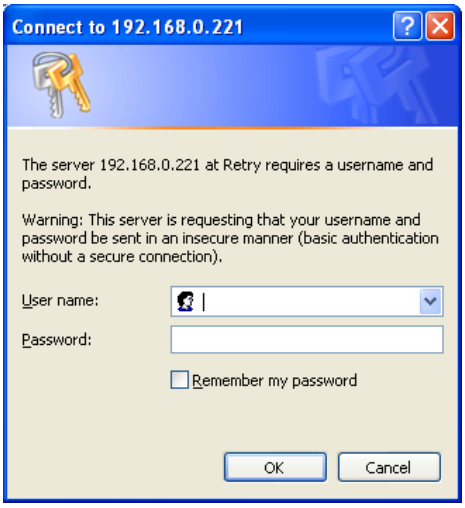
To make any changes you will be prompted for a User name and Password


Connect to 192.168.0.221
The server 192.168.0.221 at Retry requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
Password:
Remember my password
OK
Cancel

The factory default username and password is :

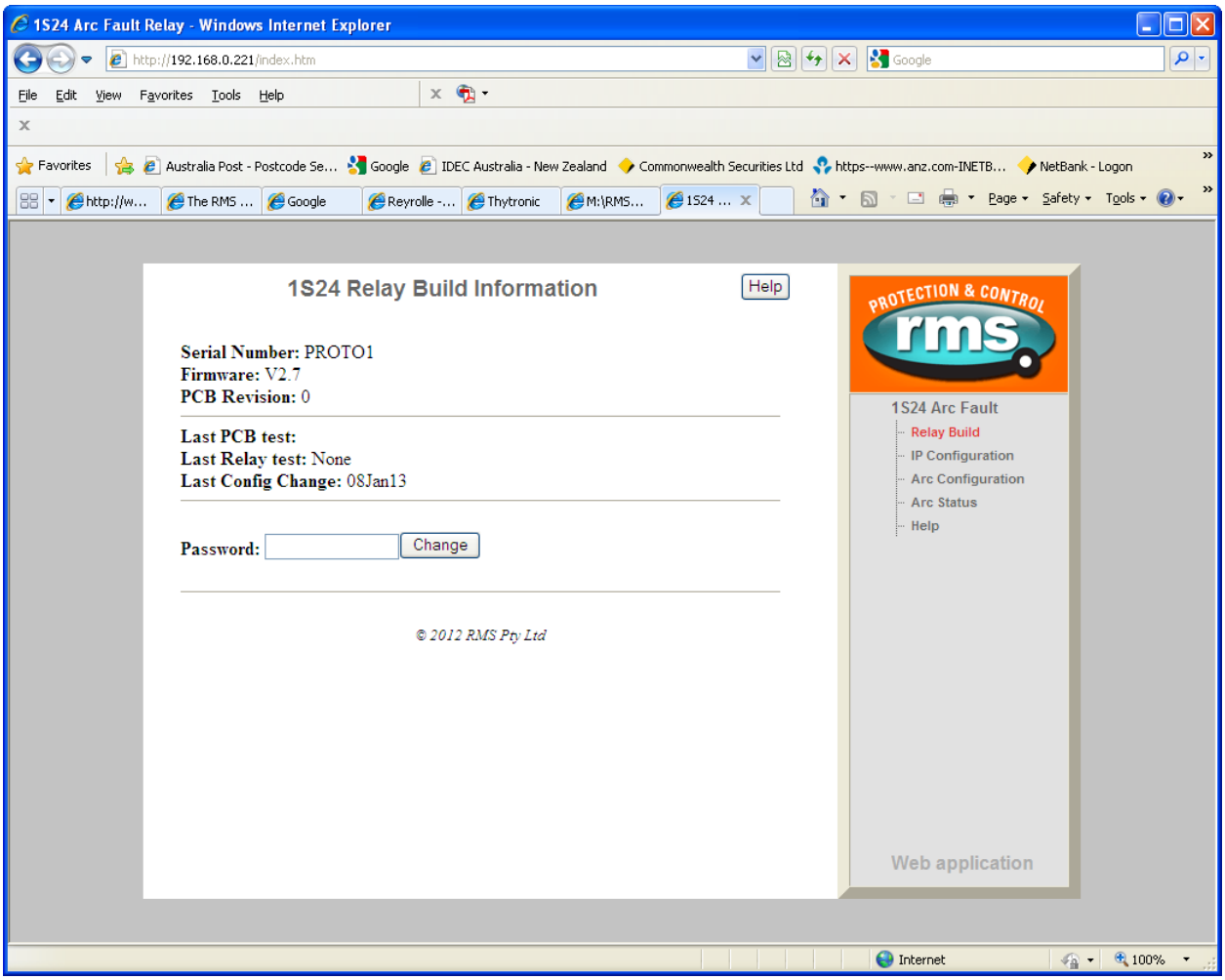
Username : admin
Passworkd : RMS

The username and password need only be entered once for each web server session and allows for multiple setting changes with access automatically timing out after 2 minutes of inactivity.

Relay Build

The Relay Build screen provides device details such as the of the Serial Number and Firmware version.

The Password may be changed at this point by entering your new password and pressing the Change button, enter the user name and previous password if prompted.



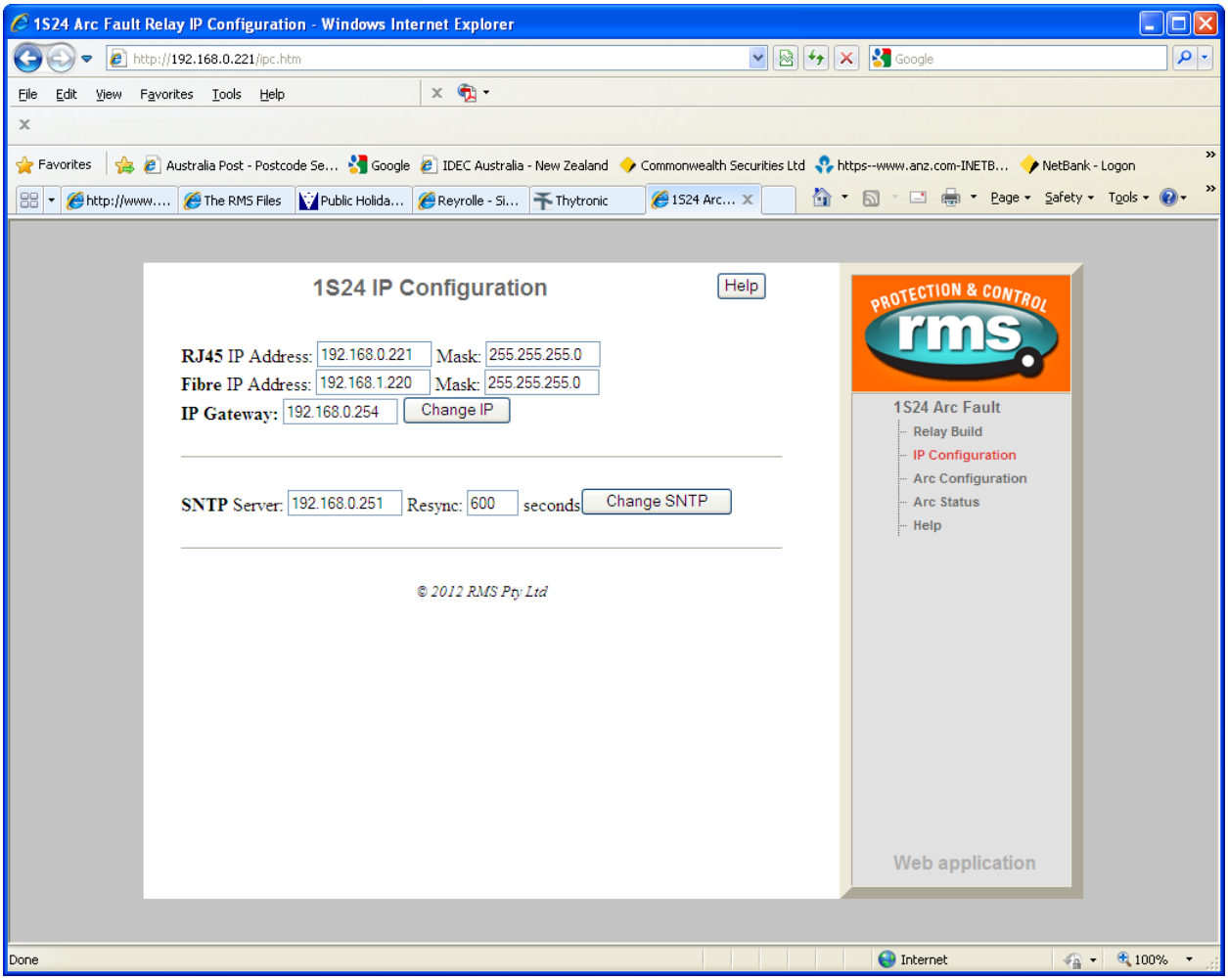
IP Configuration

The IP Configuration screen displays and allows editing of the IP address parameters for the RJ45 port, Fibre port, Gateway and the SNTP Server.

To change the IP address edit the IP address field and then click the Change button and enter the user name and password if prompted.

Note that the Fibre port must be on a different IP network to the RJ45 port.

For time stamping in accordance to the IEC61850 standard an SNTP server is required. The SNTP server IP address can be set in the IP Configuration screen but if left blank the 1S24 will attempt to find a default SNTP server if available.



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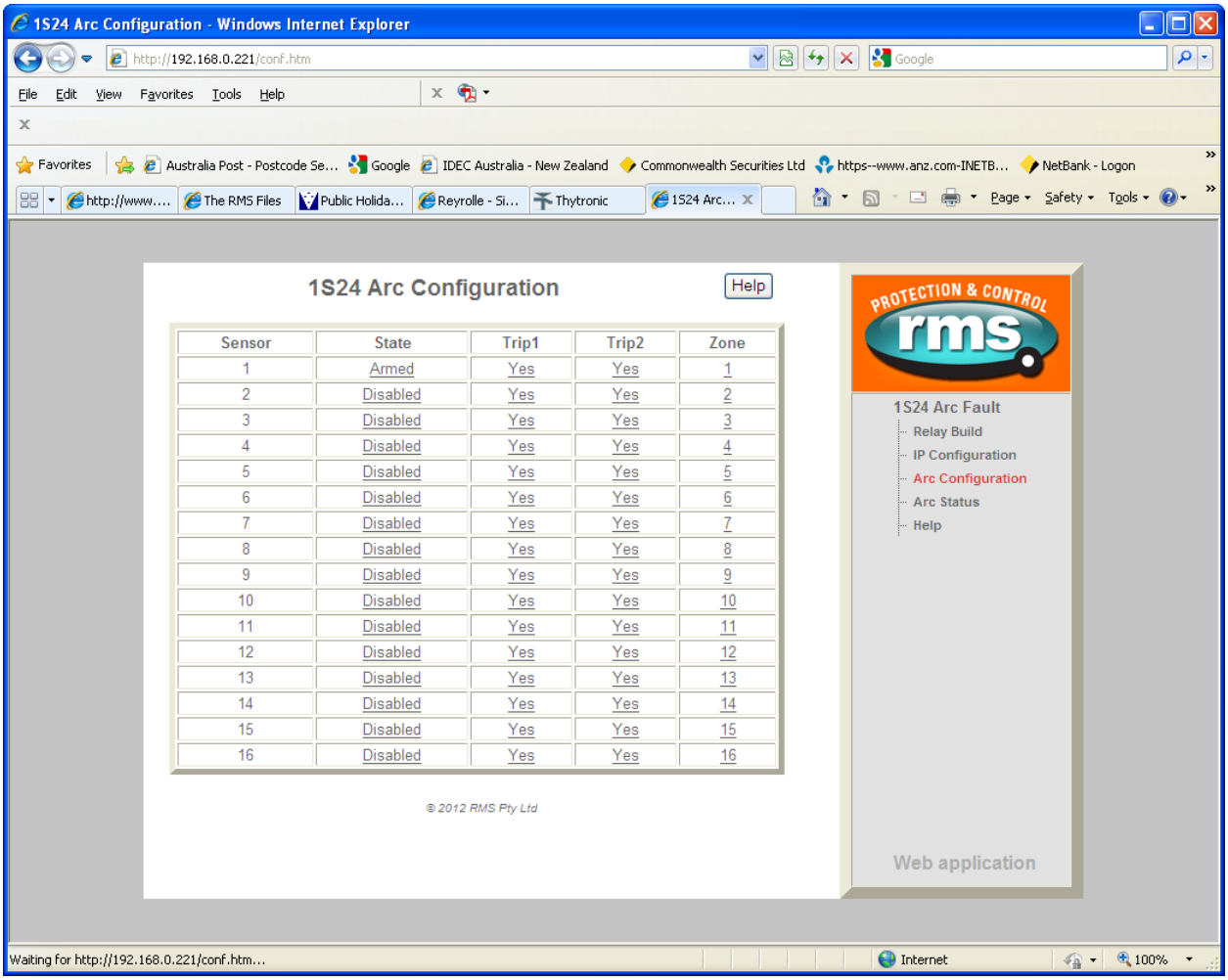
Arc Configuration

The Arc Configuration screen provides configuration settings for each of the 16 Sensor inputs.



There are 4 settable parameters for each sensor input :

State

Armed or disabled, defines if the Sensor input is enabled or disabled, click on the field to change the state and enter the user name and password if prompted.

Trip 1

Yes or No, determines if the Sensor input operates the Trip 1 output, click on the field to change the state and enter the user name and password if prompted.

Trip 2

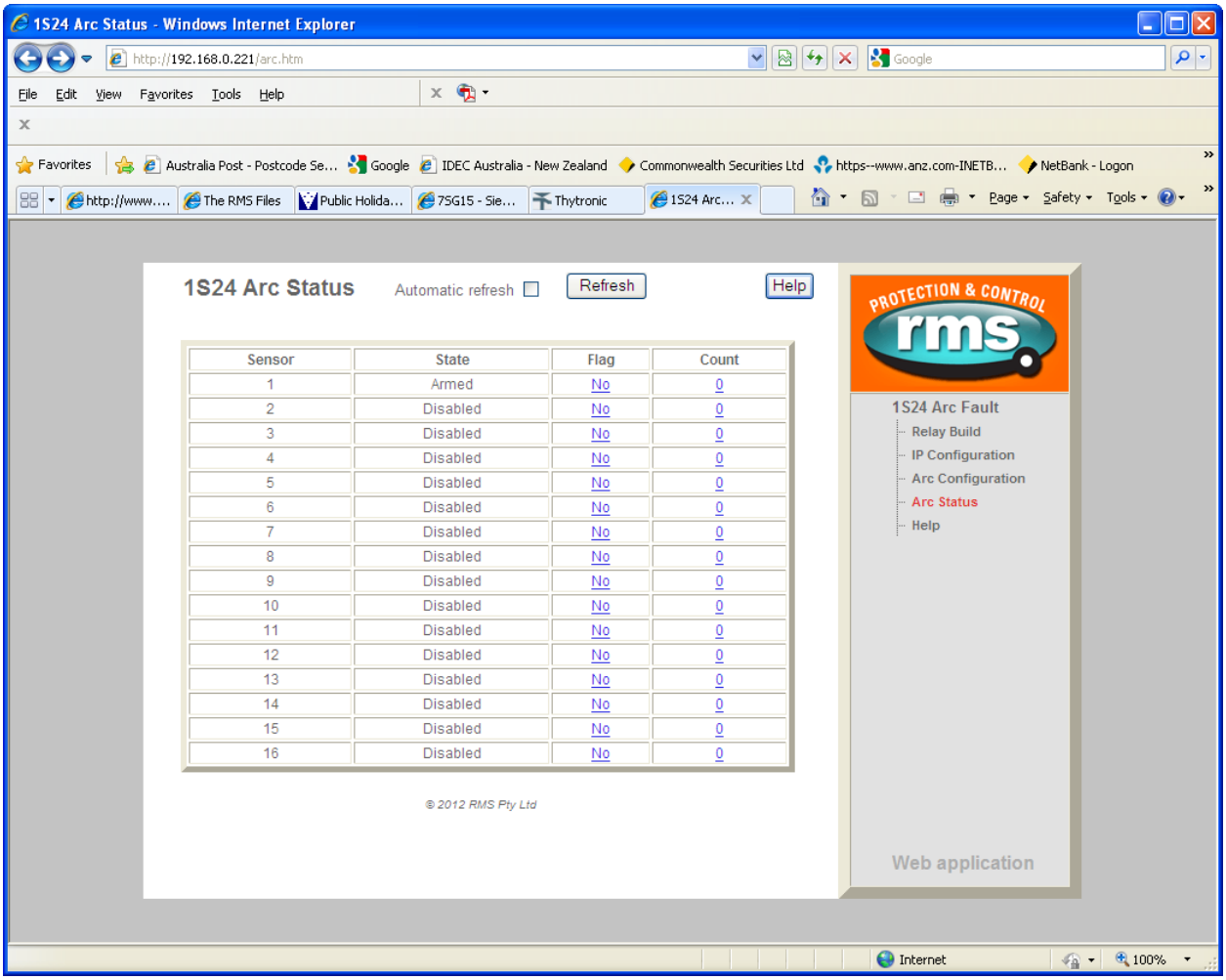
Yes or No, determines if the Sensor input operates the Trip 2 output, click on the field to change the state and enter the user name and password if prompted.

Zone

The Zone Setting provides a means of improving Goose response time for simultaneous trips in a single Arc Fault tripping zone. The Zone setting ensures that a Goose is immediately broadcast without having to wait for the updating of all arc detectors in the same corresponding zone. Allowable Zone values are from 1 to 16. Set the Zone value the same for sensors located in the same zone. Click on the field to alter the Zone value.

Arc Status

The Arc Status screen provides status information on each of the of the 16 Sensor inputs.



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State

The State column determines the state of each sensor input.

The following states are reported :

Disabled	ARC Sensor is disabled
Armed	ARC Sensor is armed
Tripped	ARC detected (changes for the period of the trip)
Failed	ARC sensor supervision failure
Initializing	ARC sensor initializing (transitory)
Stuck	ARC sensor stuck on

Flag

The Flag column will indicate and latch for an Arc Sensor operation, individual Flags may be reset by clicking on the sensor flag status and entering the user name and password if prompted.

Count

The Count field provides a log of ARC sensor operations since power on or the last counter reset, the individual sensor counters may be reset to 0 by clicking on the count field and entering the user name and password if prompted.

Summary of 1S24 SARC Configuration

The following steps outline the 1S24 SARC Configuration :

- ✓ Establish a Web Browser session using the default IP address
- ✓ Set up the IP addressing for the SNTP server
- ✓ Arm the ARC Sensor inputs to be utilised in the application
- ✓ Set which outputs are to be operated by the respective ARC sensors

IEC61850 Substation Configuration

Application Example

The following example will demonstrate the process of implementing an ARC Fault Protection scheme using IEC61850 Goose massaging in conjunction with other IEC61850 equipped IEDs.

The example will comprise of a 1S24 Arc Fault Monitor used in conjunction with Reyrolle 7SR22 Argus relays with IEC61850 communications and implemented with the Reydisp Manager productivity tool embedded with the optional Digsi System configurator.

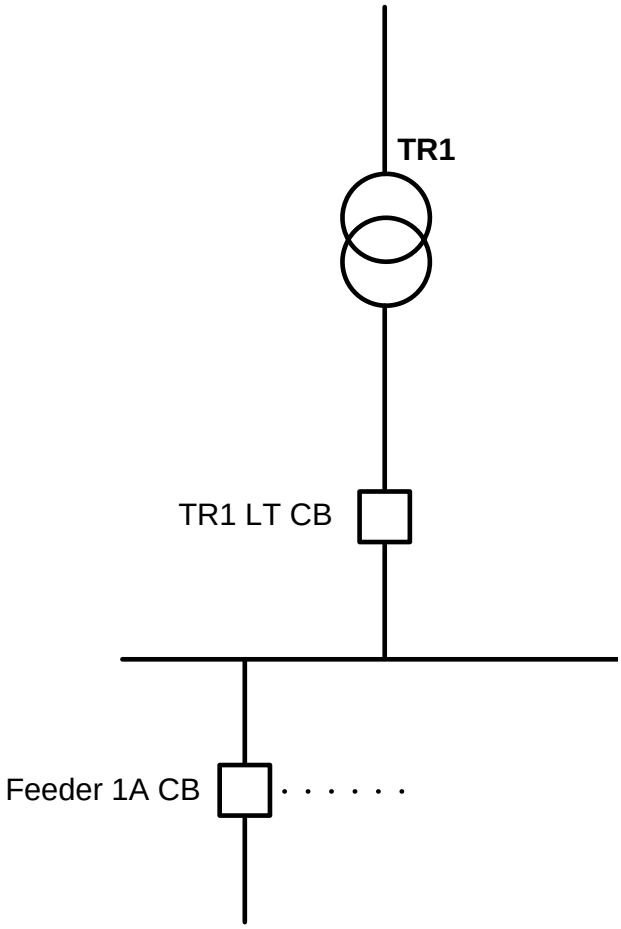
A similar process is equally applicable to IEC61850 equipped IEDs from alternative vendors and alternative System Configuration tools.

The steps to implement our Application Example are :

- ✓ Create an IEC61850 project in a System configurator
- ✓ Populate the project with the Application IEDs
- ✓ Populate the project with the 1S24 IEDs using the default 1S24 icd file
- ✓ Populate the project with the IEC61850 Substation
- ✓ Using the System Configurator configure the desired IP addressing of the subnet containing all of the application IEDs
- ✓ With the System Configurator create the GOOSE applications with the associated GOOSE linkages between the source IED logical nodes (in the case of the 1S24 : SARCs) and the subscribing IED (in our example we use GGIO)
- ✓ With all GOOSE mapping complete create a .cid file for the 1S24 using the export facility in the System Configurator
- ✓ FTP the 1S24 .cid file into the 1S24
- ✓ Reboot the 1S24 to invoke the GOOSE mapping
- ✓ Create the subscribing relay application logic that will make use of the status changes in the subscribed GOOSE messages from the 1S24
- ✓ Send the relay configurations as well as IEC 61850 to the respective subscribing IEDs in the application

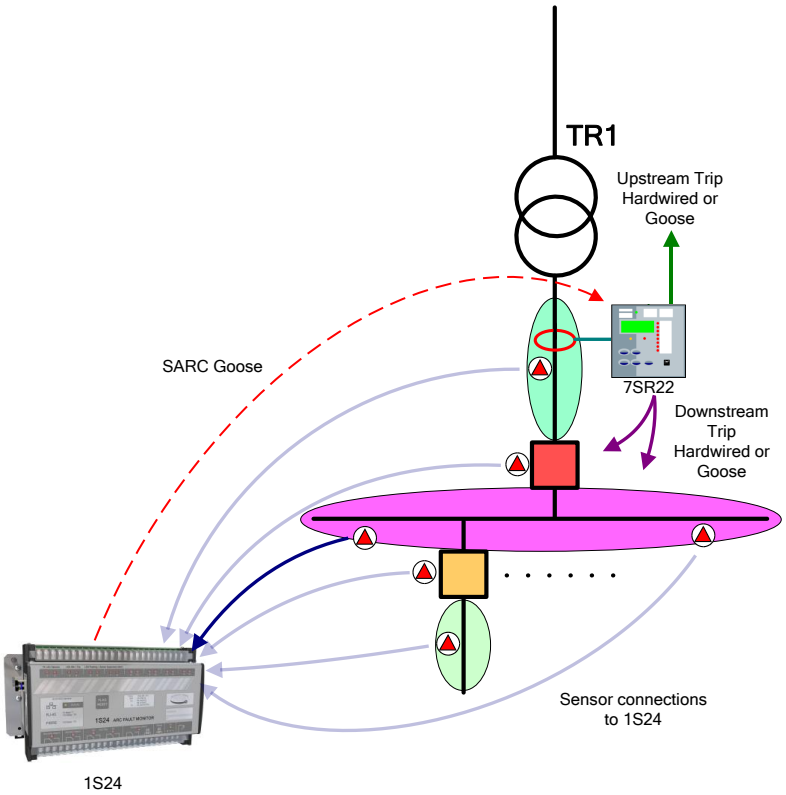
Arc Fault Scheme

The single line schematic arrangement of the application example is shown in the diagram below:



Arc Fault coverage is to be provided to the bus, circuit breaker chambers and cable termination chambers and shall be current checked with an overcurrent relay. Tripping shall be zoned to provide sectionalising and minimise affected plant.

The proposed scheme is as follows:



The scheme comprises of 1S30 sensors connected to a 1S24 Arc Fault Monitor, providing ARC Fault coverage of the coloured protection zones.

The 1S24 provides the SARC Logical Node for the operation of Arc Fault Sensors.

The 7SR22 Overcurrent relay subscribes to SARC Goose messages and initiates the required protection tripping via an Overcurrent Check.

Tripping in this case will be carried out by hardwiring to respective circuit breakers and using binary outputs from the 7SR22 IED but could also be implemented via Goose by another subscribing IED.

Flexible tripping logic may be implemented in the 7SR22 according to specific application requirements and may also accommodate different operating arrangements in more complex applications.

1S24 SARC Allocation

In the proposed scheme we have 6 Arc Fault Sensors installed providing coverage for 5 distinct protection zones. The individual SARCs are allocated as follows :

Zone Coverage	Colour	Number of Sensors	SARC Allocation
Feeder Exit Termination Chamber		1	SARC 1
Feeder CB Chamber		1	SARC 2
Bus		2	SARC 3 SARC 4
Incomer CB Chamber		1	SARC 5
Incomer Termination Chamber		1	SARC 6

Protection Zone Tripping

The required circuit breaker tripping is defined by the following tripping table :

SARC Operation	Zone Coverage	Colour	Trip
SARC 1	Feeder Exit Termination Chamber		1A CB
SARC 2	Feeder CB Chamber		TR1 LT CB
SARC 3 or SARC 4	Bus		TR1 LT CB
SARC 5	Incomer CB Chamber		Upstream
SARC 6	Incomer Termination Chamber		Upstream

1S24 Source Arc Fault Detector Points

The 1S24 will broadcast the following Arc Fault Detector Points to subscribing IEDs :

Source ARC Fault IED Goose ARC Fault Detector points		
Function	SARC	Description
SARC1	RMS_1S24/DEV_1S24/RMS_SARC1/FADET	1S24 Arc Fault Detector 1
SARC2	RMS_1S24/DEV_1S24/RMS_SARC2/FADET	1S24 Arc Fault Detector 2
SARC3	RMS_1S24/DEV_1S24/RMS_SARC3/FADET	1S24 Arc Fault Detector 3
SARC4	RMS_1S24/DEV_1S24/RMS_SARC4/FADET	1S24 Arc Fault Detector 4
SARC5	RMS_1S24/DEV_1S24/RMS_SARC5/FADET	1S24 Arc Fault Detector 5
SARC6	RMS_1S24/DEV_1S24/RMS_SARC6/FADET	1S24 Arc Fault Detector 6

7SR22 Single Point Input GGIO Allocation

The 7SR22 relay will subscribe to SARC Goose messages broadcast by the 1S24 IED and shall assign subscribed SARCs to Single Point Input GGIO as follows :

Destination 7SR22 Relay Goose Single Point Inputs **ARC Fault Detectors**		
Function	Single Point Input	Description
SARC1	CBn/CTRL/SPi64GGIO1/SPCSO1	CBn Single Point Input 1 Data
SARC2	CBn/CTRL/SPi64GGIO1/SPCSO2	CBn Single Point Input 2 Data
SARC3	CBn/CTRL/SPi64GGIO1/SPCSO3	CBn Single Point Input 3 Data
SARC4	CBn/CTRL/SPi64GGIO1/SPCSO4	CBn Single Point Input 4 Data
SARC5	CBn/CTRL/SPi64GGIO1/SPCSO5	CBn Single Point Input 5 Data
SARC6	CBn/CTRL/SPi64GGIO1/SPCSO6	CBn Single Point Input 6 Data

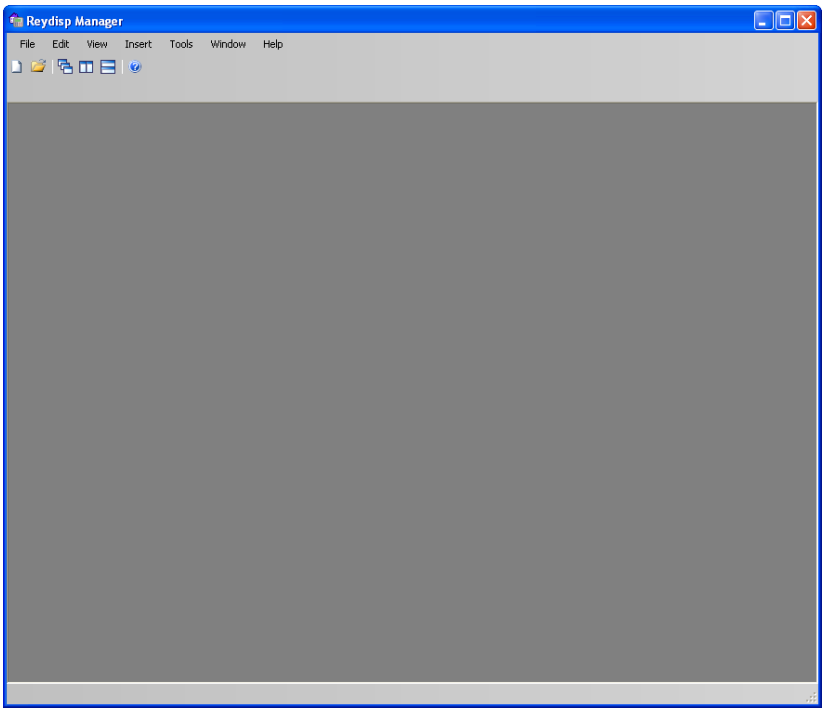
Creating An IEC61850 Project

To create and configure an IEC61850 project requires an IEC61850 system configurator.

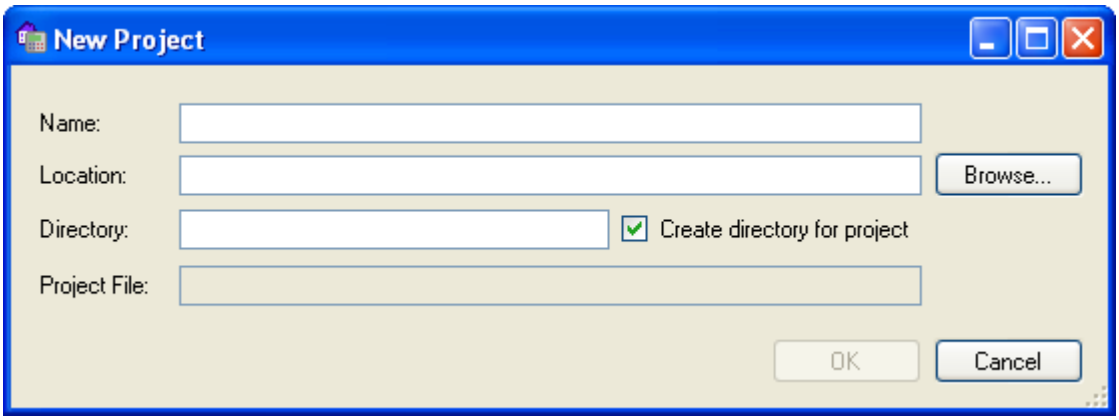
In our example Reydisp Manager with the optional embedded Digsi system configurator will be used to establish the Goose message linkages between the 1S24 and the 7SR22 Overcurrent relay.

Reydisp Manager is used as the productivity tool to manage the IEC61850 configuration process for Reyrolle relays and may also be utilised to create any required logic in Reyrolle devices.

A screenshot of Reydisp Manager is shown below :



To create a new project choose File and New.



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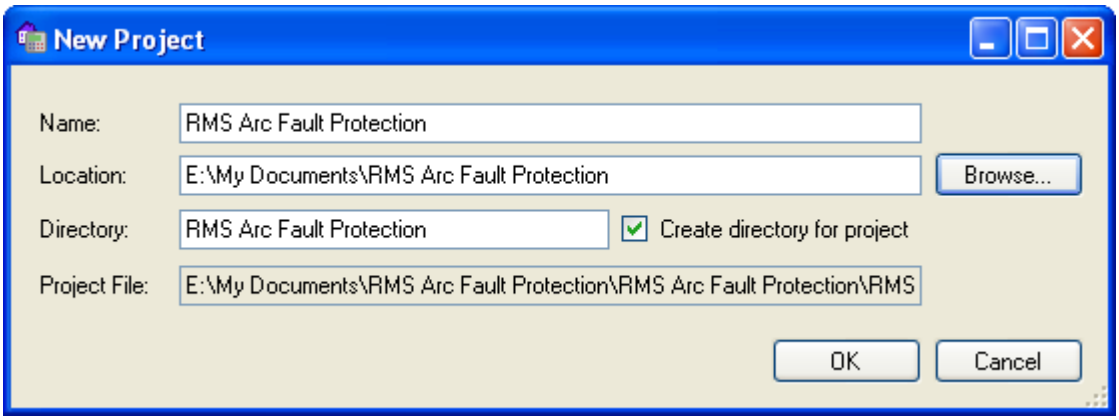
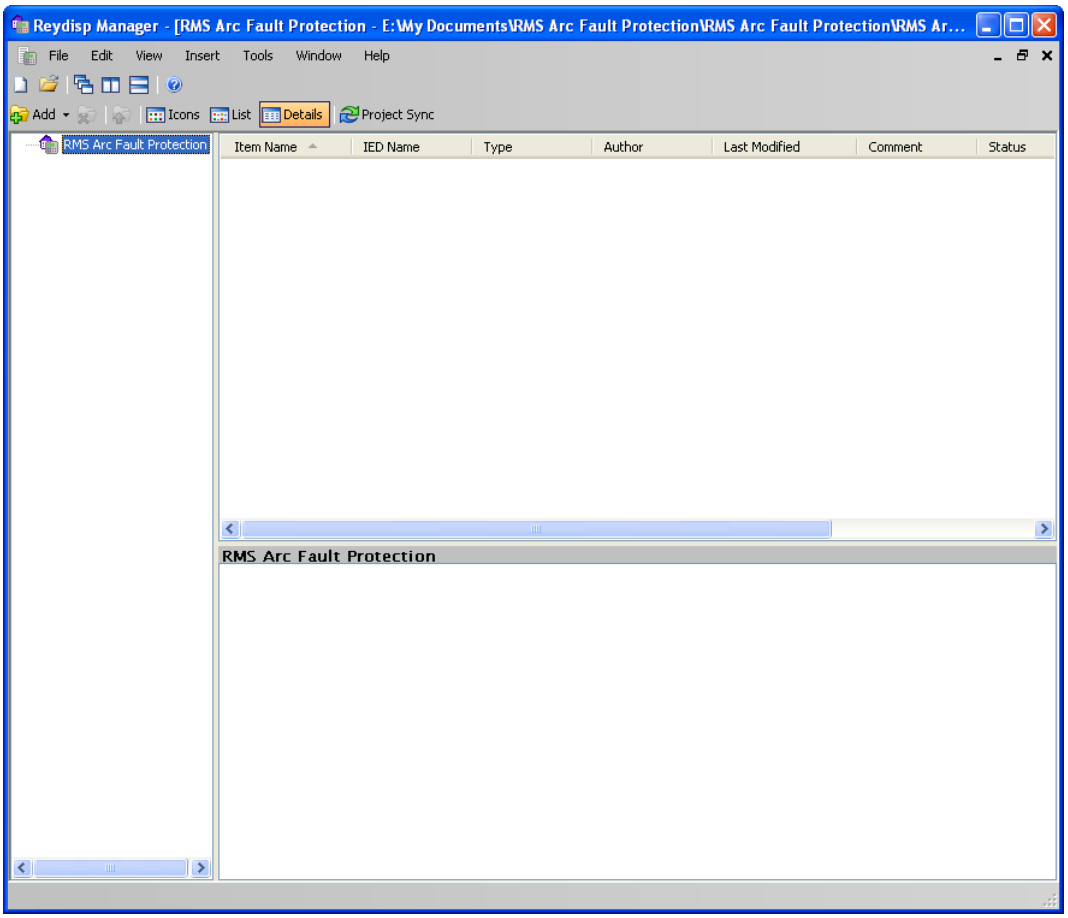
Fill in the details including where you want the project file to be stored and hit OK.

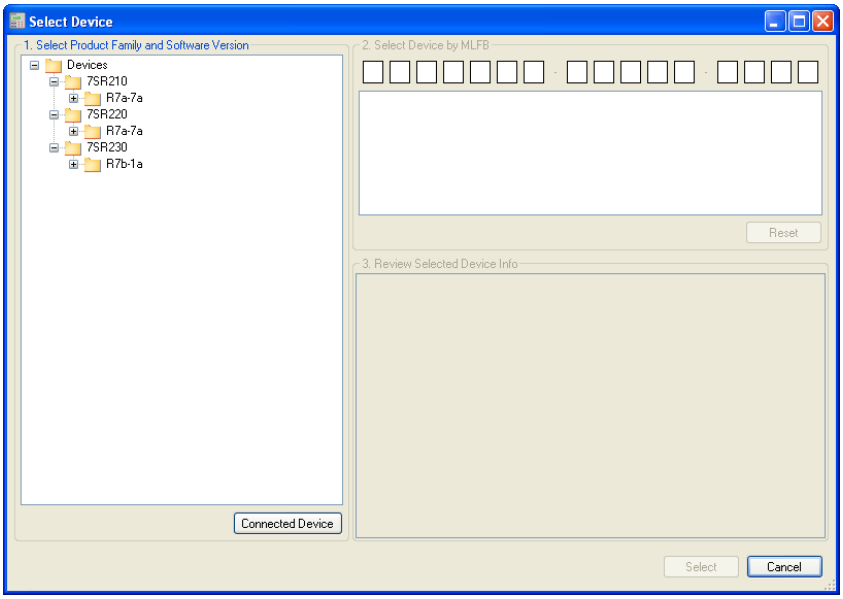


The new project has been created.

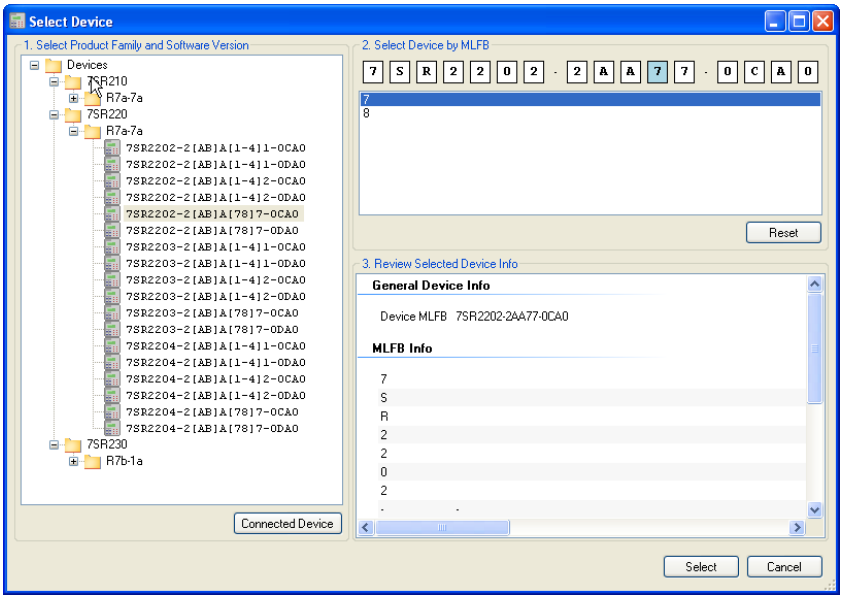


Populating IEDs In the IEC 61850 Project

We now need to populate the project with our IEDs, firstly the Reyrolle 7SR22. Choose Insert and Device and you will be presented with the following screen.

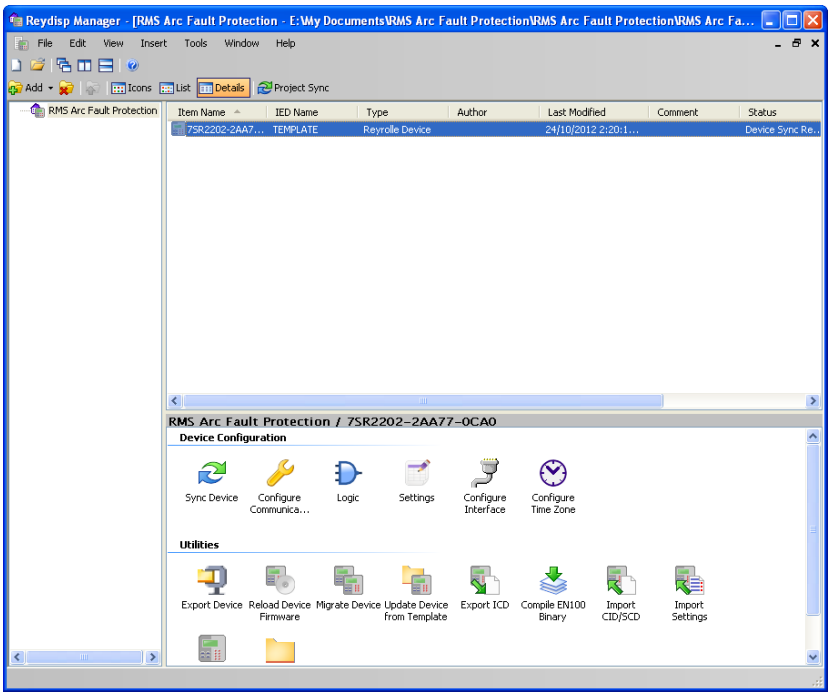


Select the required relay, for this example we will choose a 7SR2202-2AA77-0CA0 ensure that the MLFB code is correctly filled.



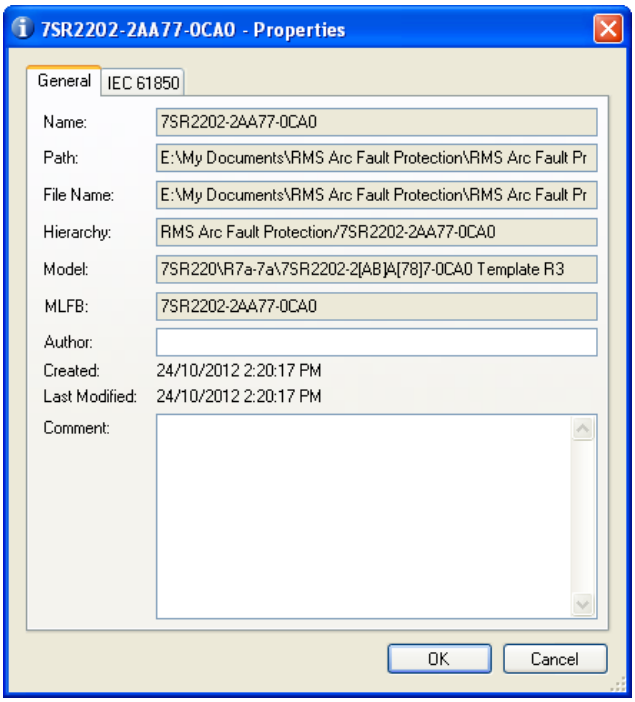
Once the MLFB codes is correctly filled you can then select the device.

The 7SR22 IED has been added to your project.

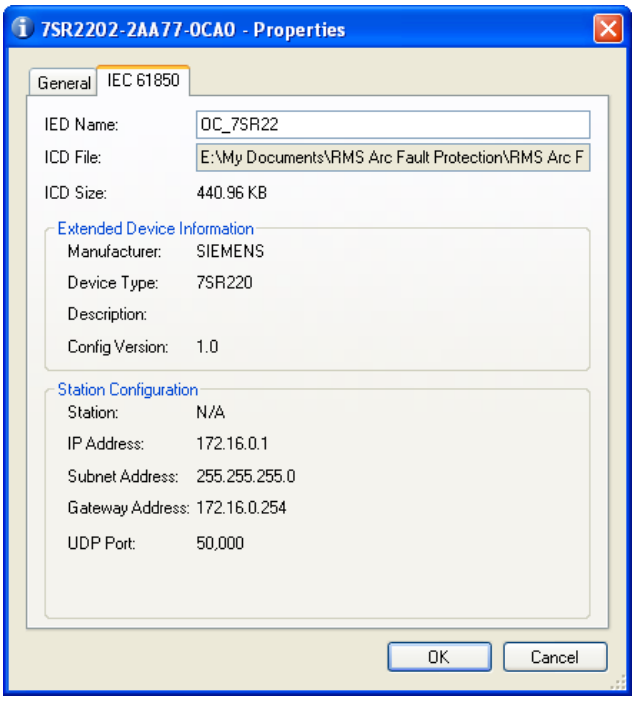

Reydisp Manager - [RMS Arc Fault Protection - E:\My Documents\RMS Arc Fault Protection\RMS Arc Fault Protection\RMS Arc Fa...
File Edit View Insert Tools Window Help
Add Icons List Details Project Sync
RMS Arc Fault Protection
Item Name IED Name Type Author Last Modified Comment Status
7SR2202-2AA7... TEMPLATE Reyrolle Device 24/10/2012 2:20:1... Device Sync Re...
RMS Arc Fault Protection / 7SR2202-2AA77-0CA0
Device Configuration
Sync Device
Configure Communica...
Logic
Settings
Configure Interface
Configure Time Zone
Utilities
Export Device
Reload Device Firmware
Migrate Device
Update Device from Template
Export ICD
Compile EN100 Binary
Import CID/SCD
Import Settings

Continue adding Reyrolle IEDs as required using the same process.

Nominate a meaningful IED name for each IED by right clicking on the IED and choosing properties.

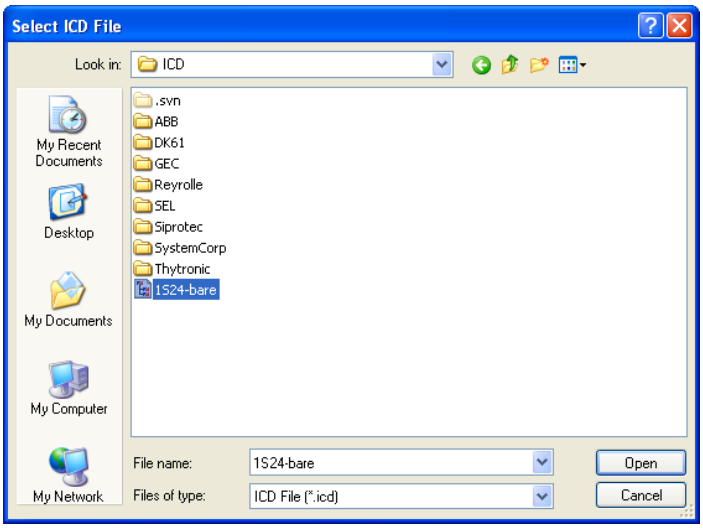


Choose the IEC 61850 tab and enter a name in the IED Name field.



Next we will add the RMS 1S24 IED which is added as a Third Party ICD File. You will need to have the 1S24 ICD file which is available through RMS.

Choose Insert and Third Party ICD File and you will be presented with the following file selection, choose the ICD file that has been supplied by RMS.



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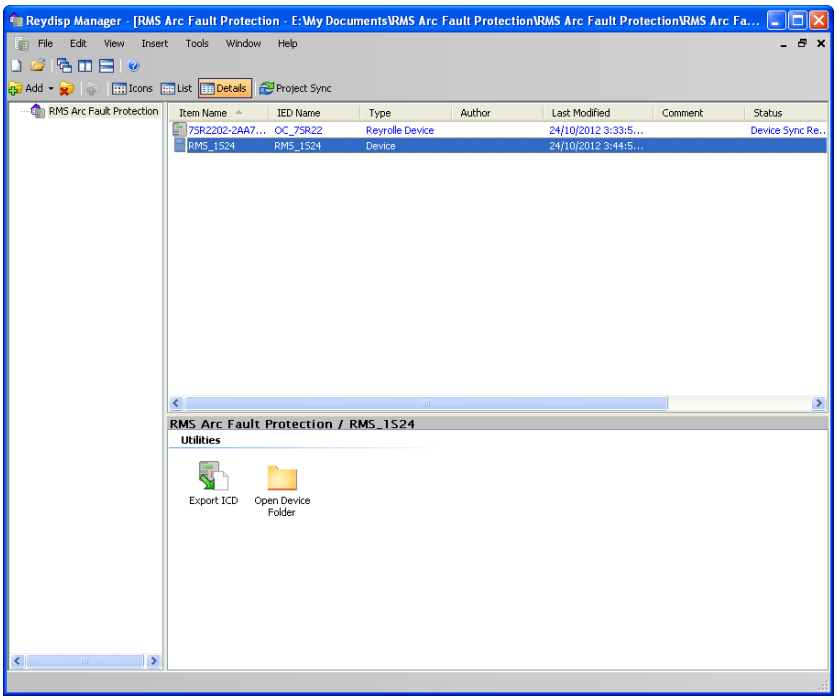
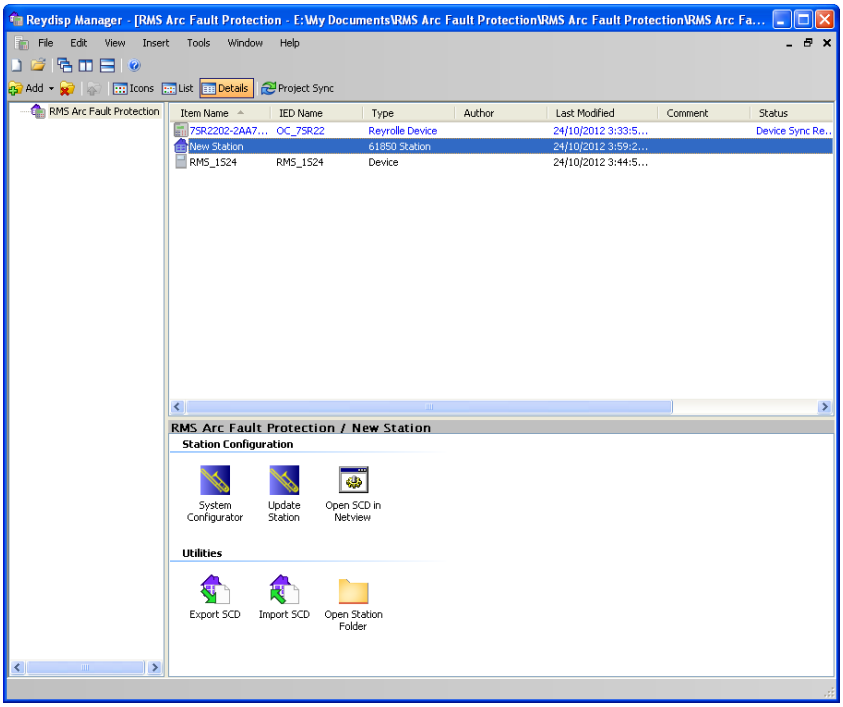
The 1S24 IED has now been added to your project.


Reydisp Manager - [RMS Arc Fault Protection - E:\My Documents\RMS Arc Fault Protection\RMS Arc Fault Protection\RMS Arc Fa...
File Edit View Insert Tools Window Help
Add Icons List Details Project Sync
RMS Arc Fault Protection
Item Name IED Name Type Author Last Modified Comment Status
7SR2202-2AA7... OC_7SR22 Reyrolle Device 24/10/2012 3:33:5... Device Sync Re...
RMS_1S24 RMS_1S24 Device 24/10/2012 3:44:5...
RMS Arc Fault Protection / RMS_1S24
Utilities
Export ICD
Open Device Folder

You can nominate a meaningful IED name for the 1S24 IED by right clicking on the IED and choosing properties.

Now we will add a IEC61850 Station, choose Insert and Station.


Reydisp Manager - [RMS Arc Fault Protection - E:\My Documents\RMS Arc Fault Protection\RMS Arc Fault Protection\RMS Arc Fa...
File Edit View Insert Tools Window Help
Add Icons List Details Project Sync
RMS Arc Fault Protection
Item Name IED Name Type Author Last Modified Comment Status
7SR2202-2AA7... OC_7SR22 Reyrolle Device 24/10/2012 3:33:5... Device Sync Re...
New Station 61850 Station 24/10/2012 3:59:2...
RMS_1S24 RMS_1S24 Device 24/10/2012 3:44:5...
RMS Arc Fault Protection / New Station
Station Configuration
System Configurator
Update Station
Open SCD in Netview
Utilities
Export SCD
Import SCD
Open Station Folder

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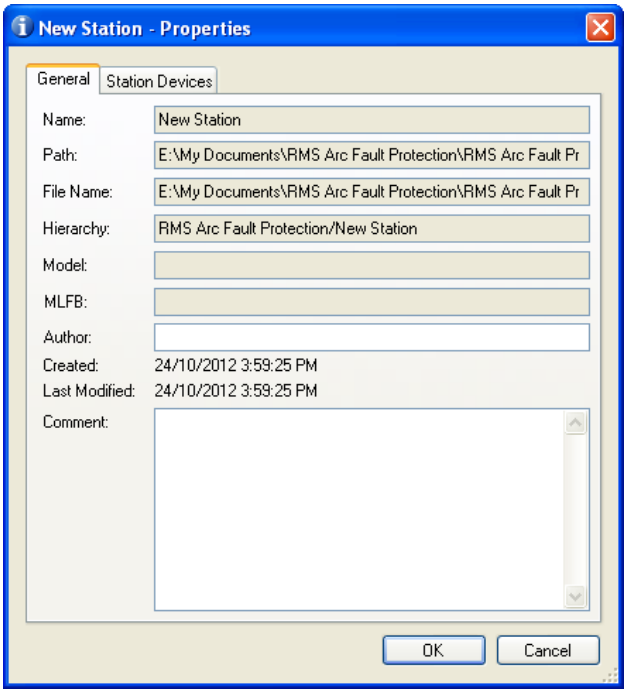
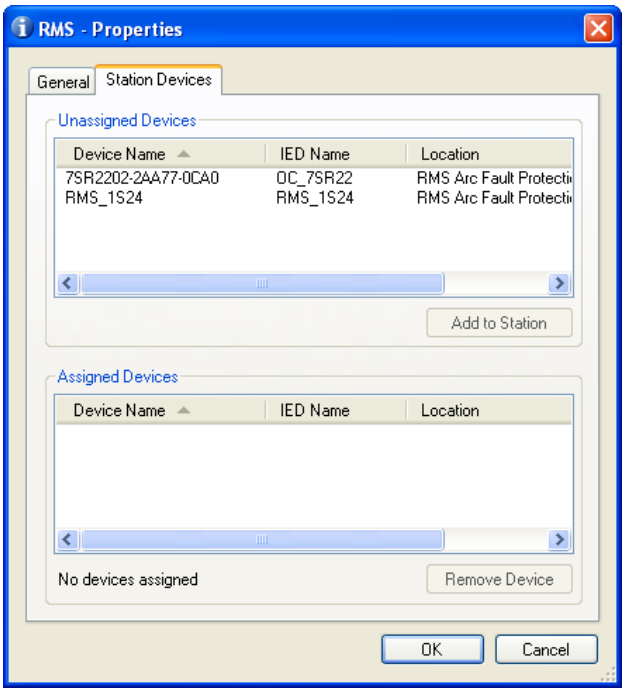
We can give the Station a meaningful name by editing the Item Name. We then nominate the Station Devices to be included in the Station by right clicking on the Station and choosing properties.



Select Station Devices and you will see a selection of available unassigned IEDs



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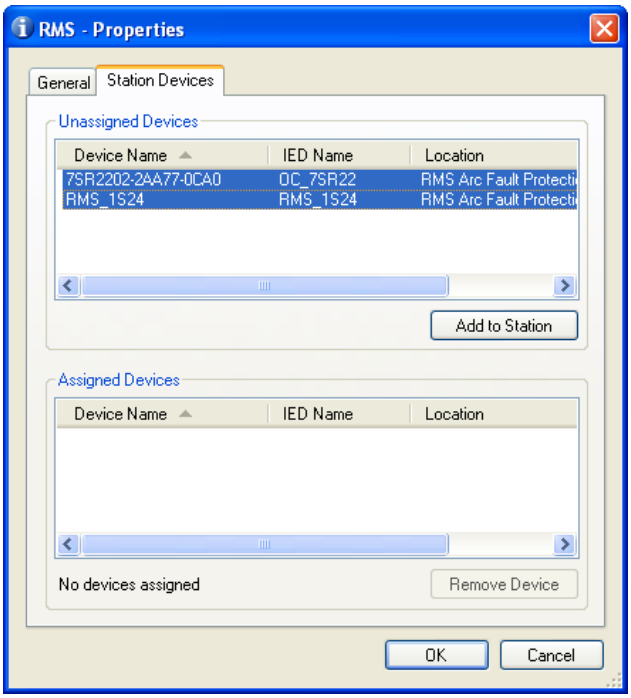
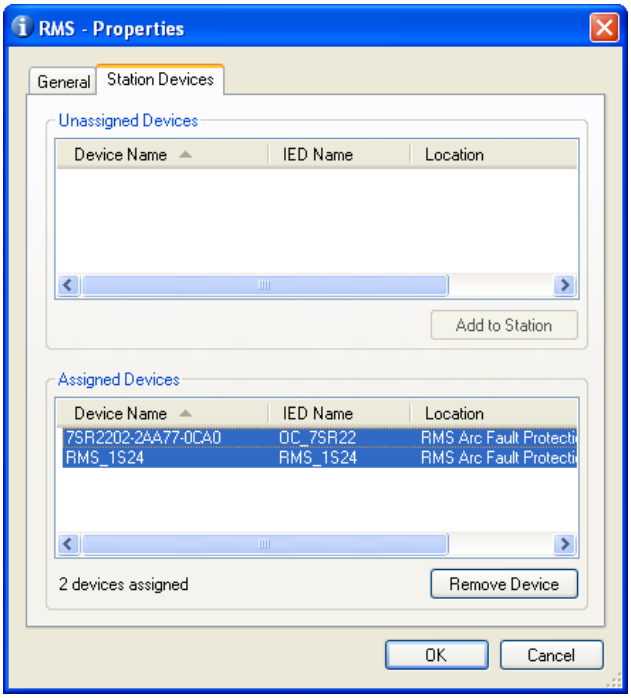
Select the IEDs



Press Add to Station.



Press OK to Assign the Devices to the Station.

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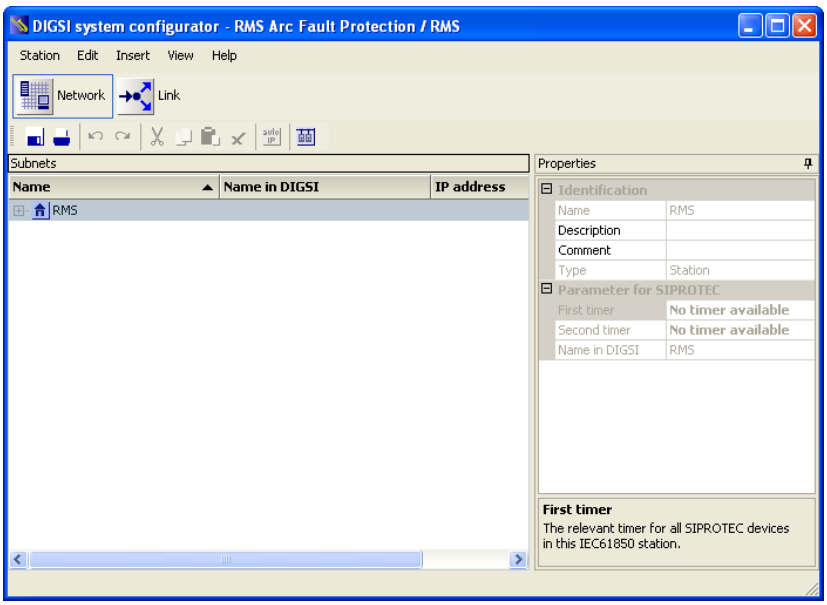
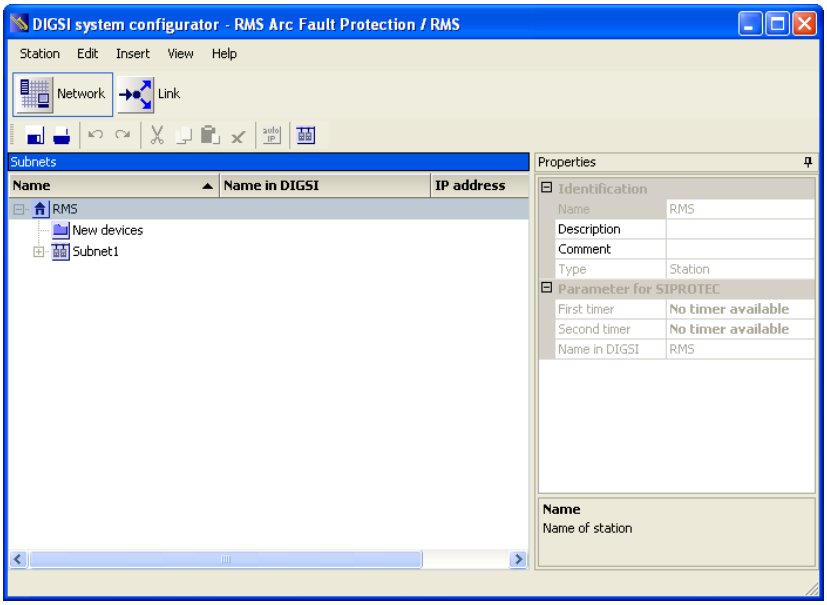
System Configuration – Network View

We now need to configure the IP Addressing for our Station LAN and the Goose Linkages for our Goose messages.

With the Station highlighted Double Click the System Configurator Button, this will start the Digsi System Configurator in the Network view.



Expanding the RMS Station will present the Subnets associated with the Station.



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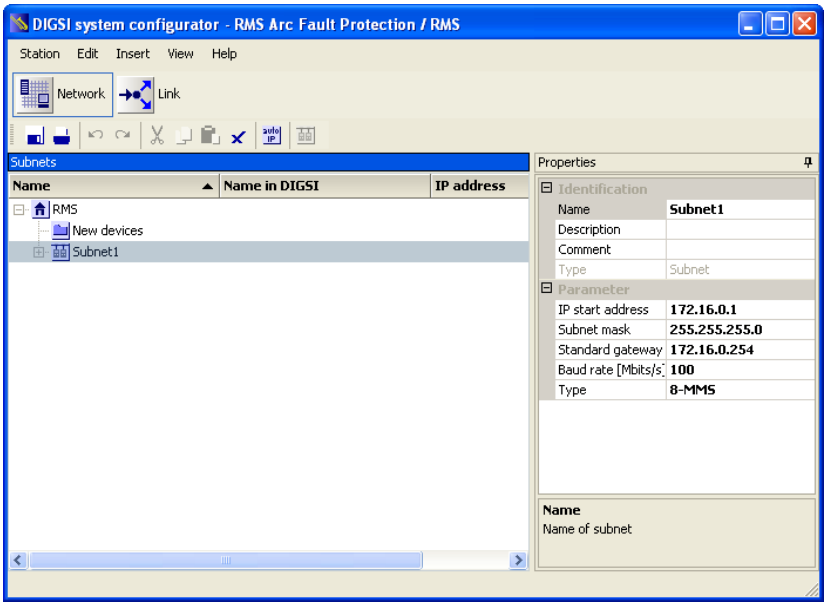
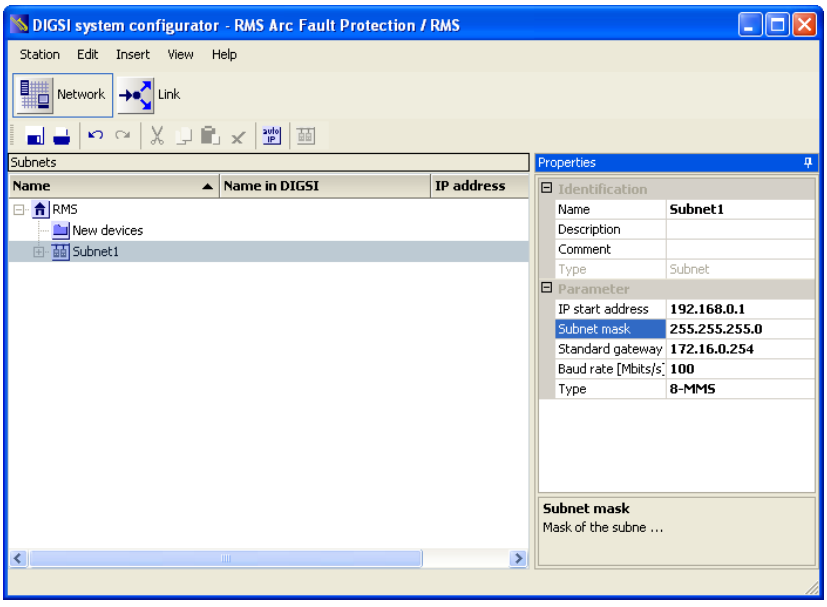
Clicking on the Subnet will reveal the IP Start address, Subnet mask and standard gateway settings.



We can set the IP start address for our network for convenience, in this case 192.168.0.1. The Standard Gateway may also be set at this point if one exists.



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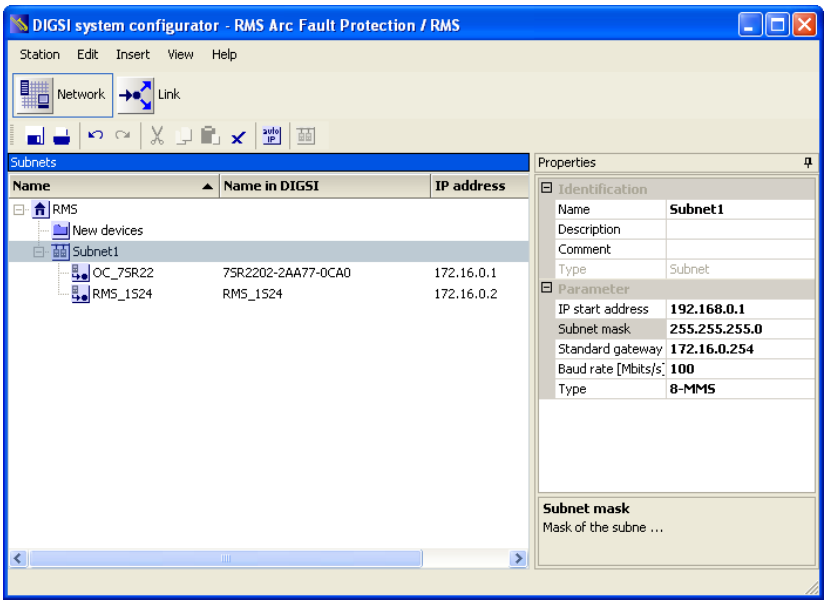
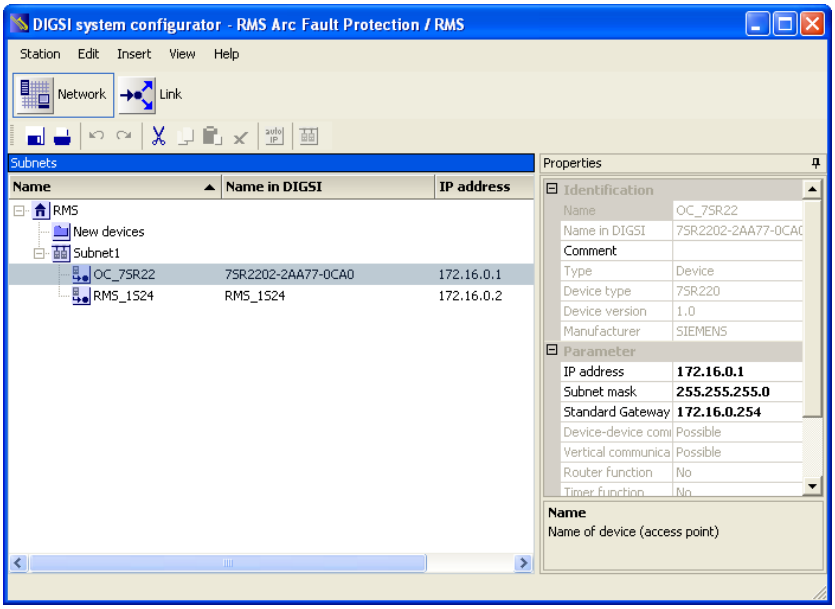
Expanding Subnet1 will reveal the IEDs that we previously assigned to the Station.

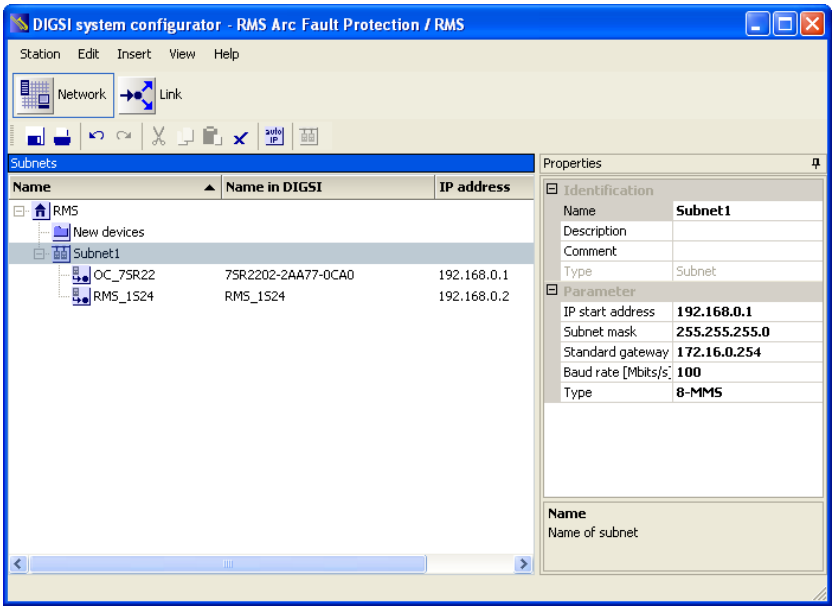


The individual devices may be selected to set their IP addresses.



Alternatively at the Subnet level the IP addressing may be automatically allocated starting at the IP start address previously set for the Subnet by pressing the auto IP button.

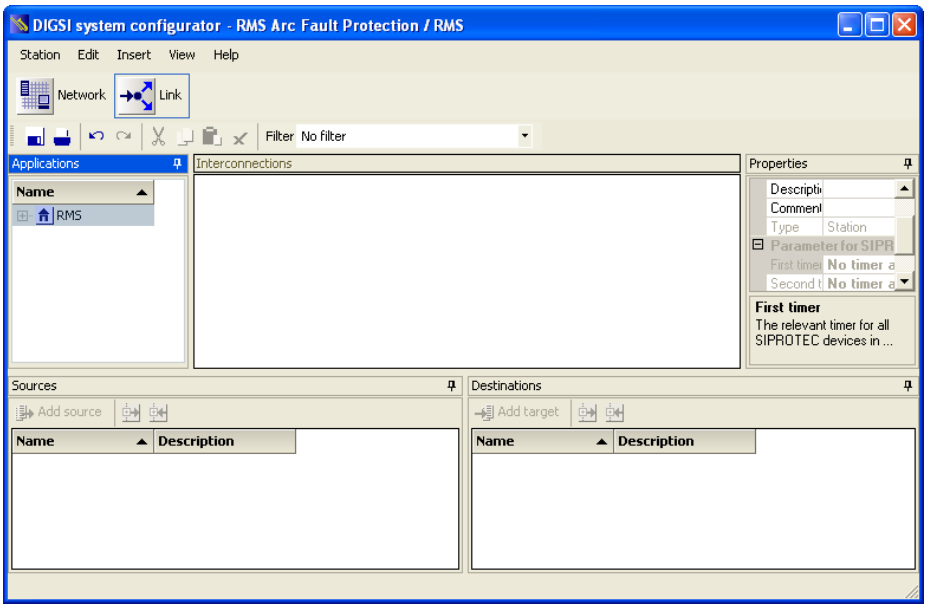
We'll choose to auto allocate the IP addressing, the result is shown below with the the IP address of each device being incremented and unique.



System Configuration – Link View

With the network addressing having been completed we'll now create our GOOSE applications and associated GOOSE linkages.

The screenshot below shows the link view with the RMS Station :



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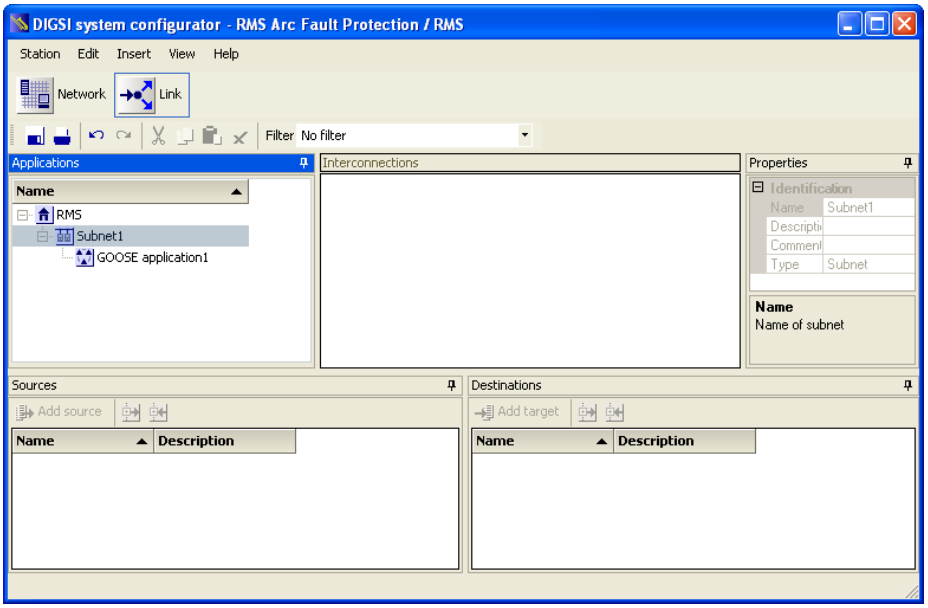
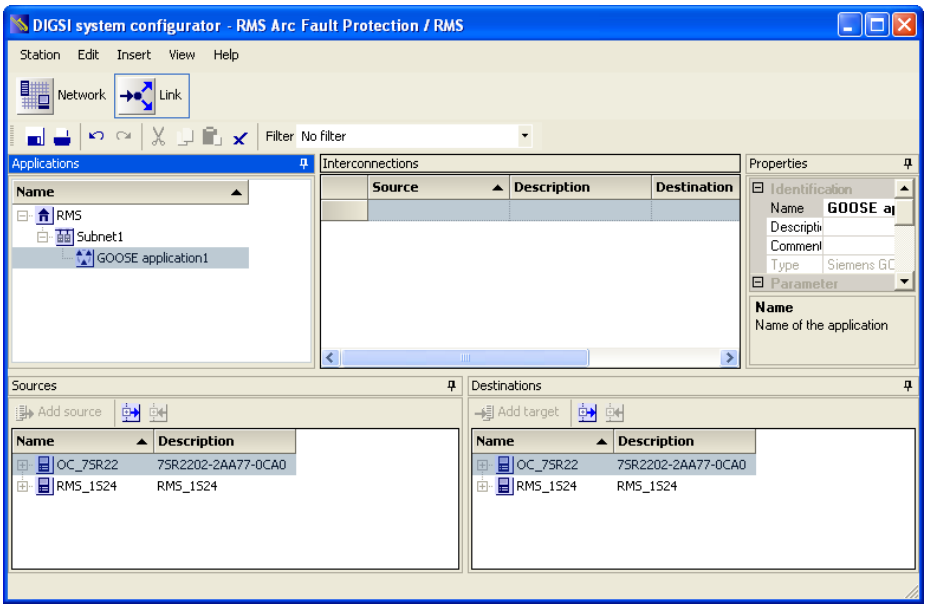
The Applications window lists all the applications by Station, drilling down into the RMS station will reveal the Subnets and any associated reports or GOOSE applications.



An existing GOOSE application may be used or alternatively a New GOOSE application created.

For our example we'll use the existing GOOSE application 1, selecting this application reveals the associated IEDs as sources and destinations.



Expanding the respective IEDs in the Sources and Destinations windows will show the Logical Nodes and their associated Data Objects.

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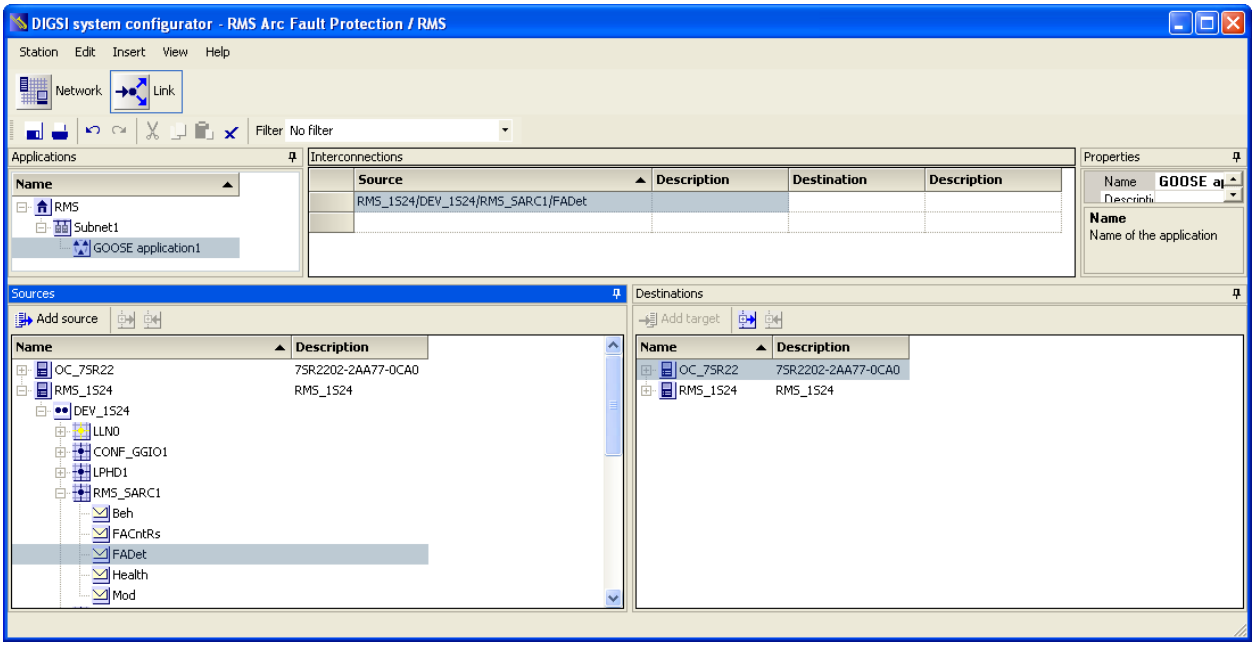
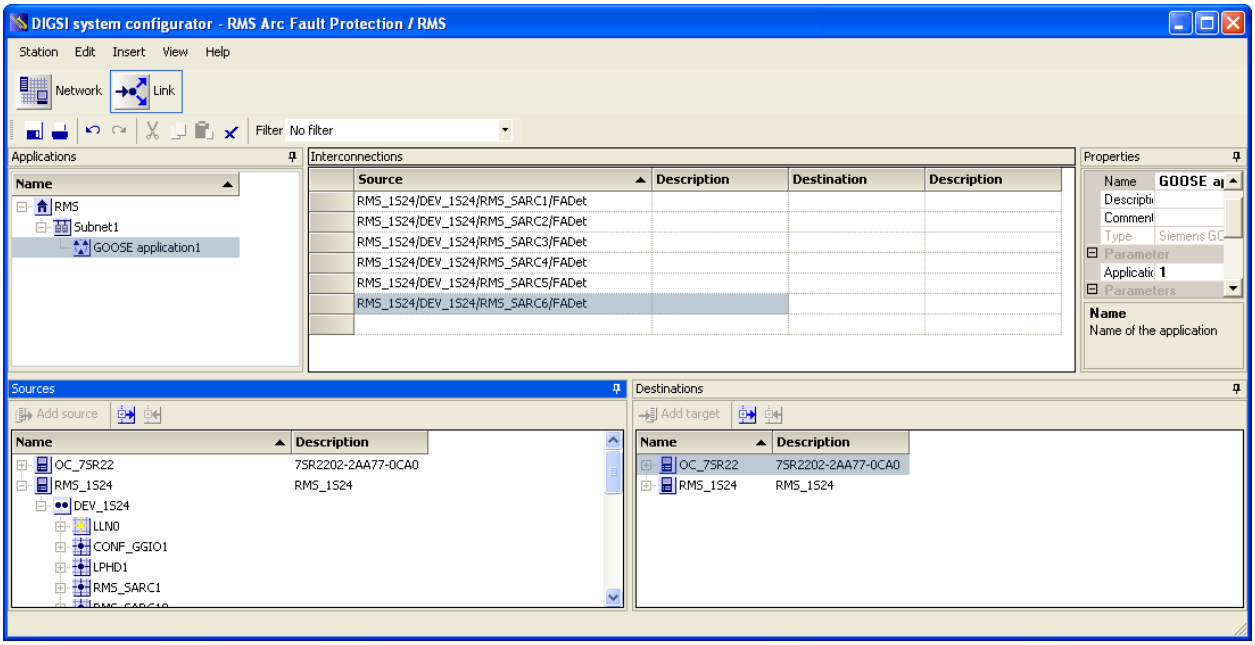
Firstly we'll select the RMS_1S24 IED and expand RMS_SARC1 and choose FADet to Add as a Source.



Once Added as a source it will appear in the interconnections. In turn add all of the required source SARCs.



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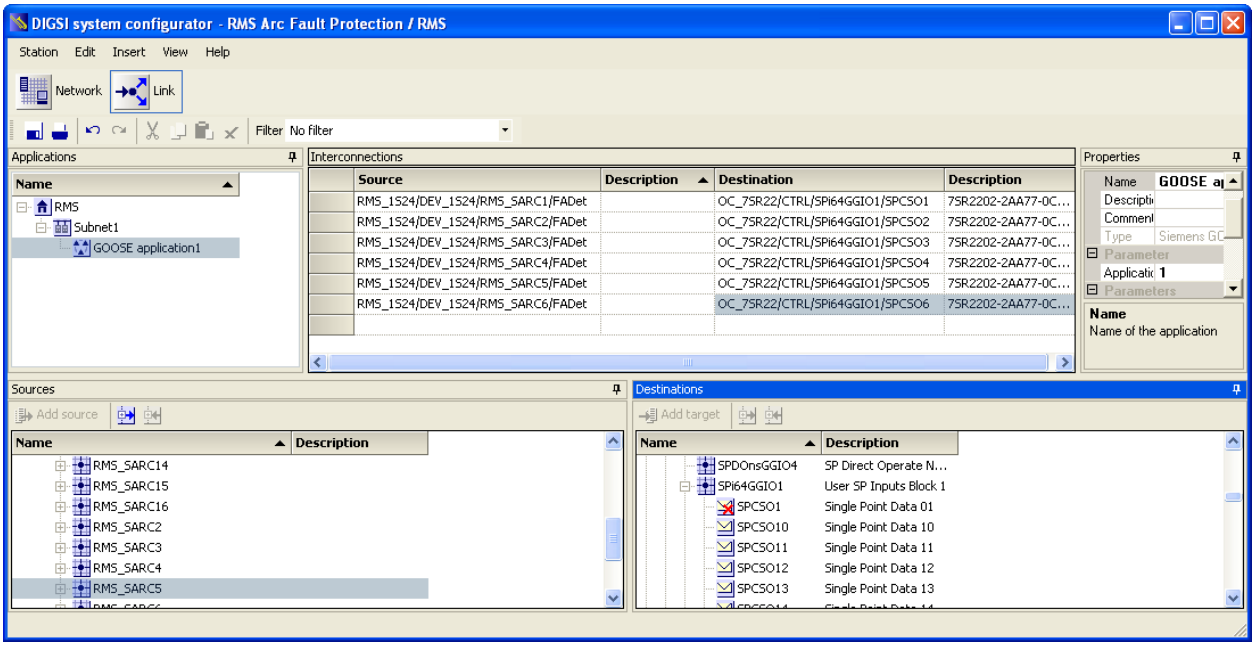
The SARCs are linked to the respective 7SR22 IED Single Point Input GGIO chosen from the Destinations window (refer also to the Allocation table in the earlier part of this example).



With the linkages complete save and exit the Digsi System configurator.

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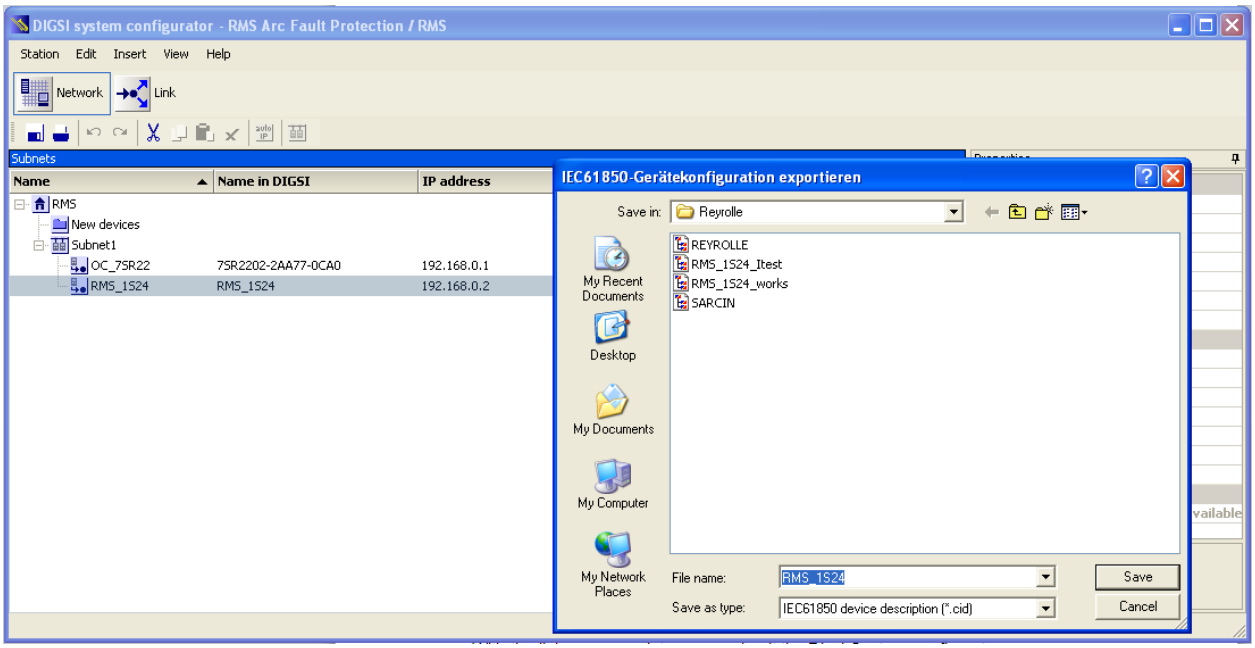
Creating the 1S24 .cid File

We know need to create a .cid file which we will use at a later stage of the IED Configuration process.

Note : The following highlighted steps are required to address a particular idiosyncrasy of Digsi :

1. Open the Station in Reydisp Manager, go to the link screen and make a change to a linkage and save the project.
2. Ensure you then revert the linkage back to original and save the project again.

Now go to the Network screen, select the 1S24 IED, right click and select Export IEC61850 device configuration.



Save the file for later 1S24 configuration.

System configuration is now complete.

1S24 IEC61850 Configuration

The .cid File

The 1S24 requires a .cid file that incorporates the IEC61850 Substation Project Configuration including the Report datasets that must be sent and where they are sent to.

The Project Configuration is contained in the .cid file for the 1S24 created earlier from our Substation configuration process example and needs to be loaded into the 1S24 IED.

FTP 1S24.cid File

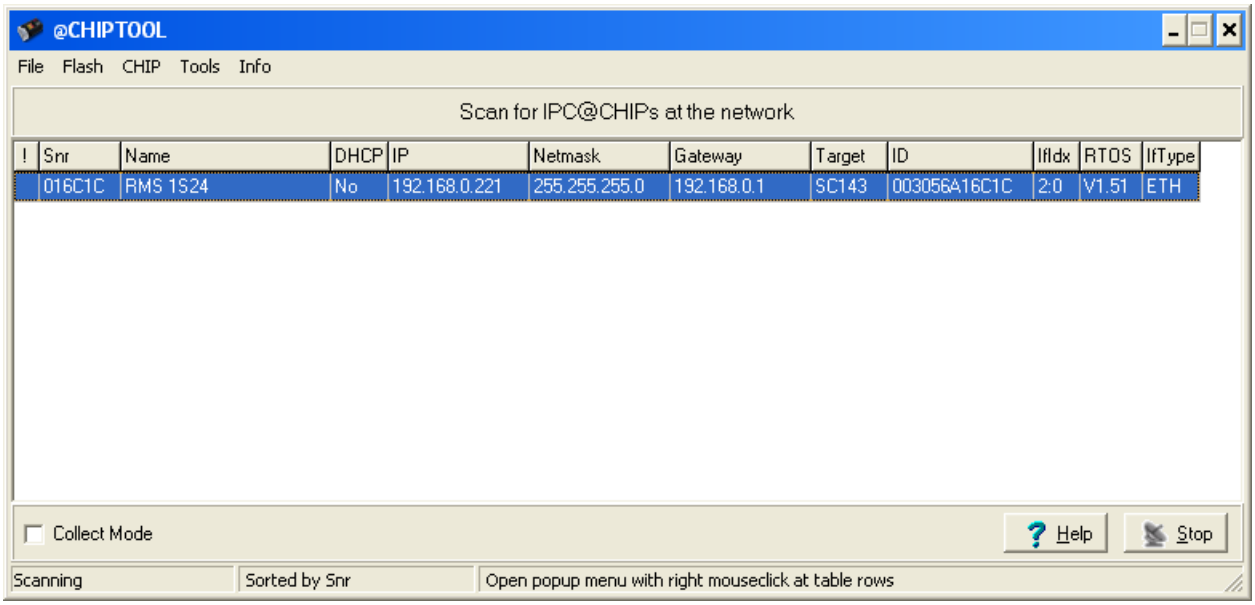
We will be using the Beck's @CHIPTOOL software utility to establish a terminal session with the 1S24 and to FTP the .cid file.

Download @CHIPTOOL for free from :

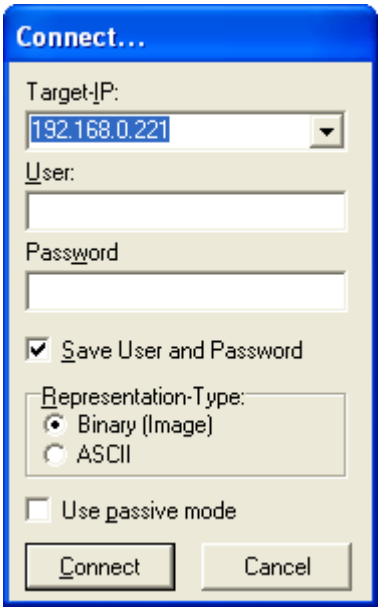
http://www.beck-ipc.com/en/download/licence.asp?id=chiptool_install&l=1

Run @CHIPTOOL on the PC.

The Tool will detect any 1S24 devices on the network as seen by the screen shot below :

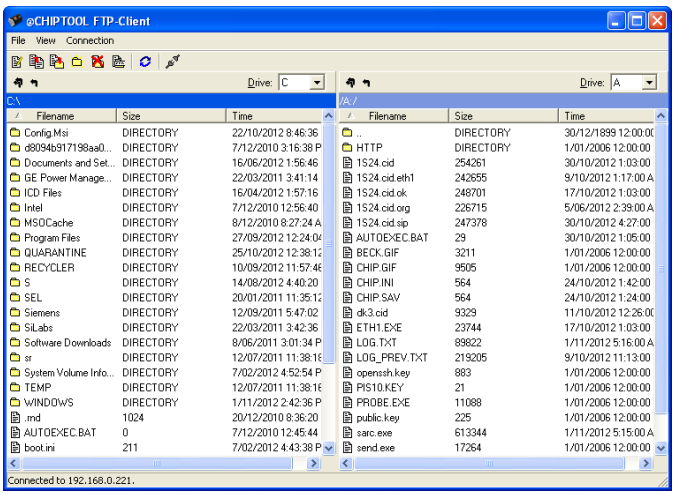

@CHIPTOOL
File Flash CHIP Tools Info
Scan for IPC@CHIPs at the network
! Snr Name DHCP IP Netmask Gateway Target ID IfIdx RTOS IfType
016C1C RMS 1S24 No 192.168.0.221 255.255.255.0 192.168.0.1 SC143 003056A16C1C 2:0 V1.51 ETH
Collect Mode
Help
Stop
Scanning
Sorted by Snr
Open popup menu with right mouseclick at table rows

With the 1S24 selected in the @CHIPTOOL screen we will establish an FTP session by choosing Tools and FTP-Client.



Enter the following Username and Password for the FTP session :

User : ftp
Password : ftp

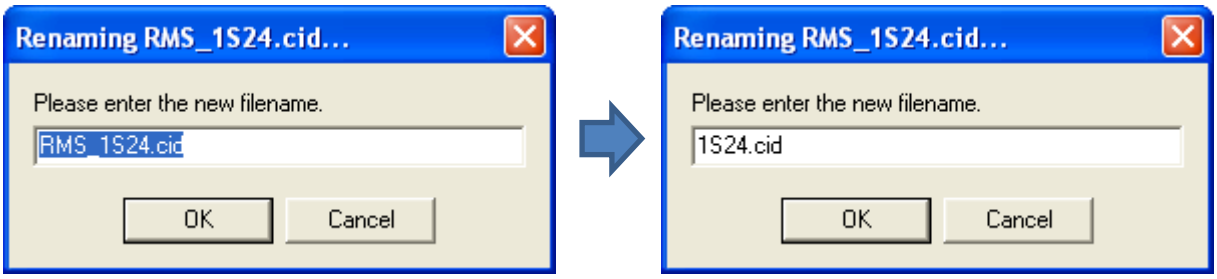


You will be presented with 2 file directories, the left side is the source directory and the right side A:/ is the 1S24.

Locate and select the saved 1S24.cid file created earlier, right click on the file and copy it to the A:/ drive.

Once copied, ensure that any existing 1S24.cid file in the A:/ drive is renamed or deleted (right click on the file for renaming deletion options).

Then select the copied file in the A:/ drive, right click and ensure it is renamed as 1S24.cid.



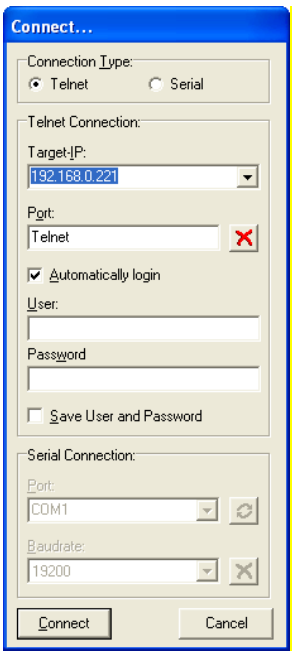
Rebooting The 1S24 With The New 1S24.cid File

A reboot of the 1S24 is required once the new 1S24.cid file has been loaded.

The reboot can be done either via powering down and repowering the device or by pressing and holding the Flag Reset button for about 5 sec until all the LEDs start flashing, refer to Reboot under Monitor Indications.

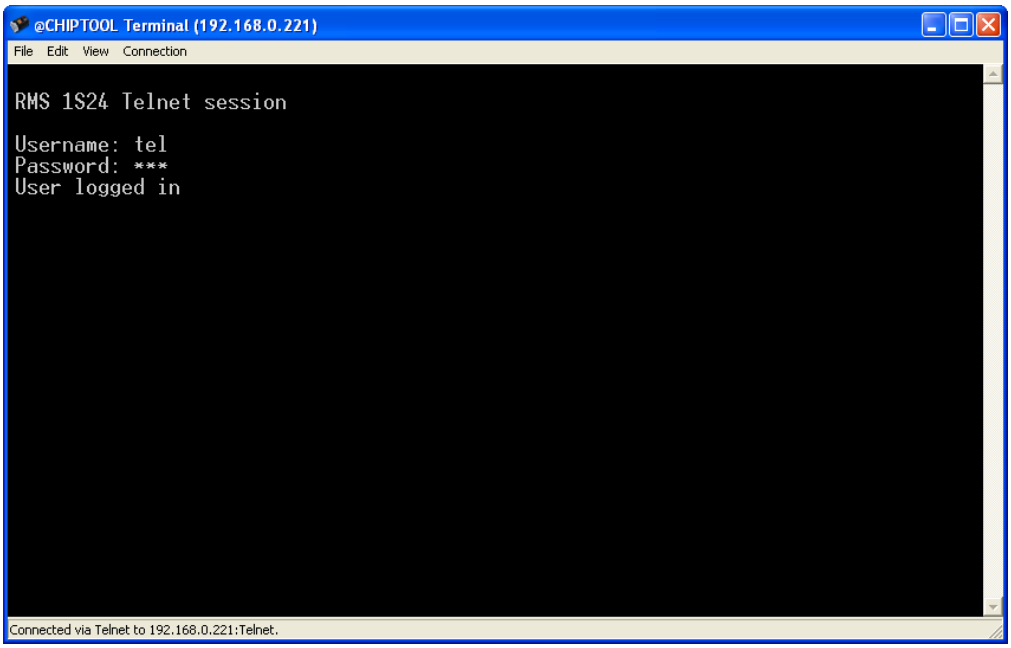
Alternatively you can set up a terminal session to reboot the 1S24 using @CHIPTOOL.

Using @CHIPTOOL select the 1S24 and choose Tools and Terminal.

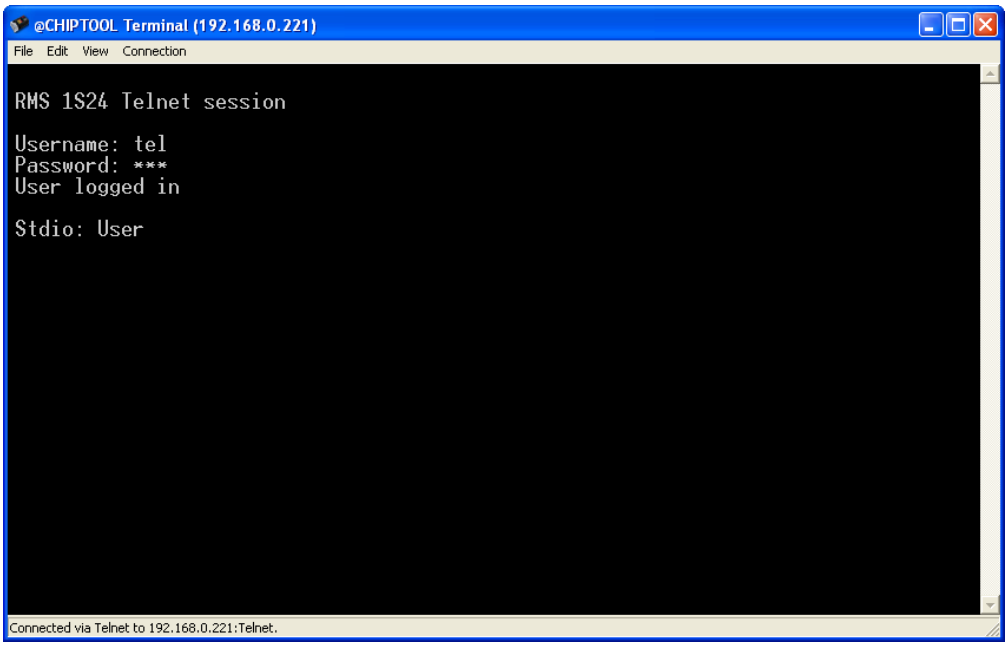


Enter the following Username and Password for the terminal session :

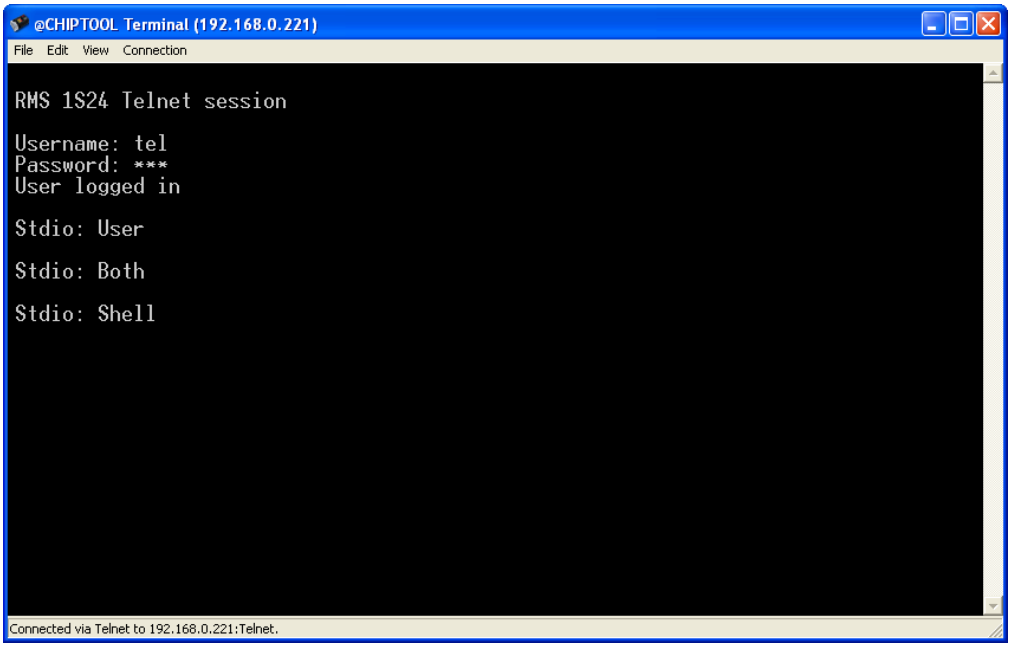
User : tel
Password : tel



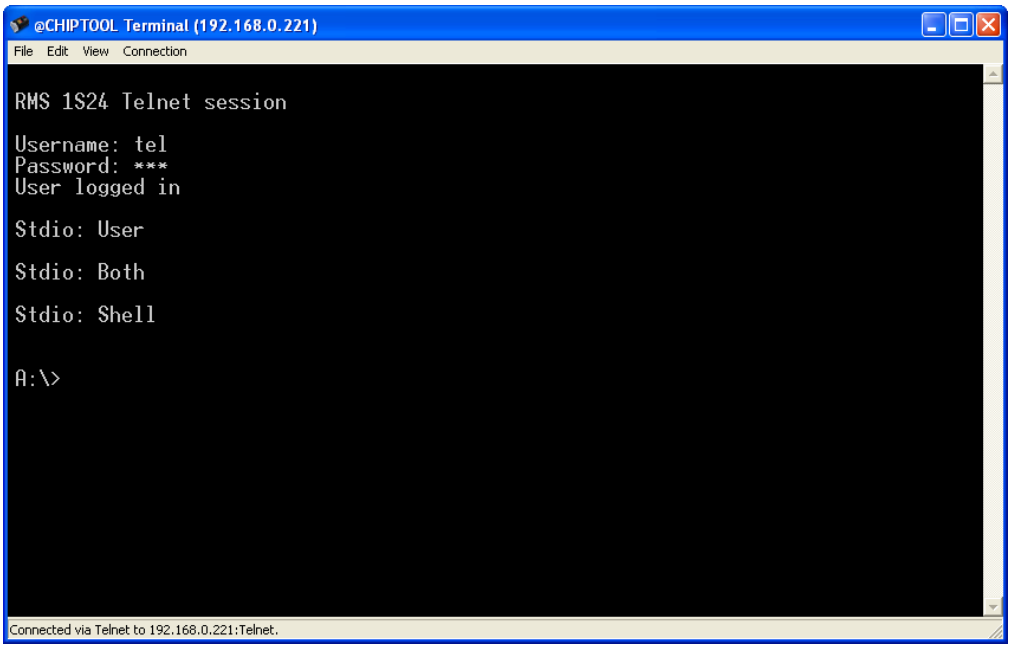
Use CTRL-F to check the context.



You need to be in Shell. CTRL-F to switch the context to Shell.



Press enter to make the command prompt visible.



Type in Reboot at the command prompt, the 1S24 will now restart and the LEDs indicate per a normal power up, refer to Power Up - Monitor Indications.

When all the LEDs stop flashing the 1S24 configuration is complete.

Reyrolle 7SR22 Configuration

Logic Configuration

Our application is to employ a current check using the pickup of an Instantaneous Overcurrent Element (50-1) to qualify an Arc Sensor operation. The following sections outline the logic implemented.

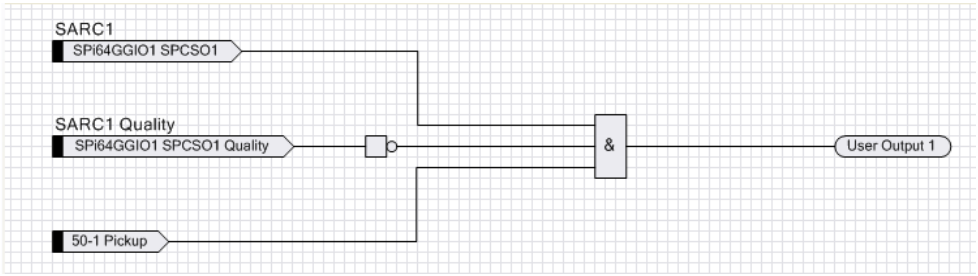
User Output Allocation

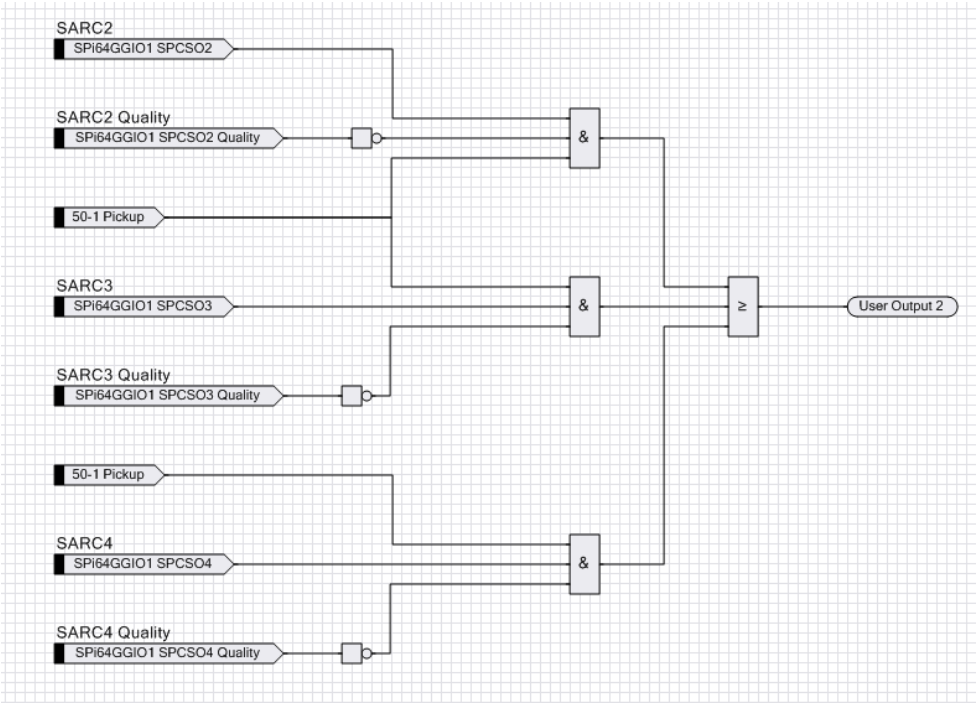
Using the previously defined ARC Fault Sensor Zones we will nominate the User Outputs that will capture the resultant SARC operation and current check logic.

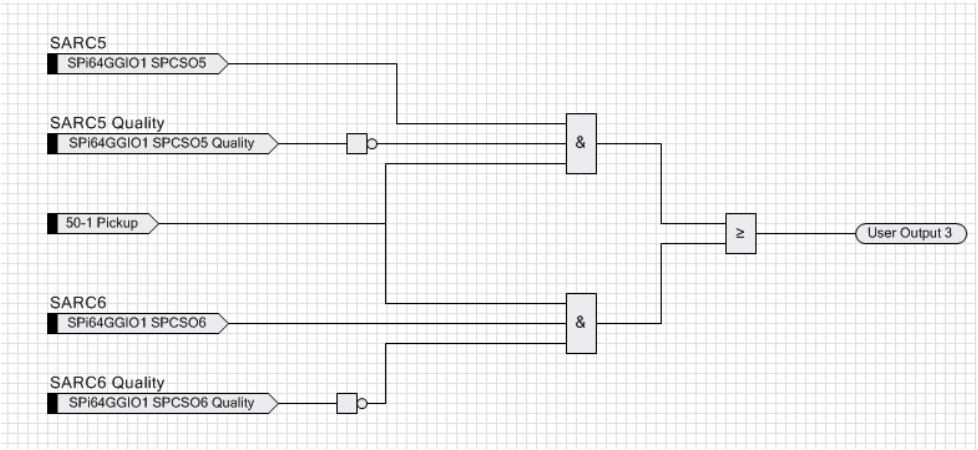
Zone Coverage	Colour	SARC Allocation	User Output
Feeder Exit Termination Chamber		SARC 1	User Output 1
Feeder CB Chamber		SARC 2	User Output 2
Bus		SARC 3 SARC 4	User Output 2
Incomer CB Chamber		SARC 5	User Output 3
Incomer Termination Chamber		SARC 6	User Output 3

Current Check Logic

The SARC GOOSE Trips are qualified by the SARC quality and a current check in our current check logic. The quality bit can be used for blocking purposes such as testing or isolations.





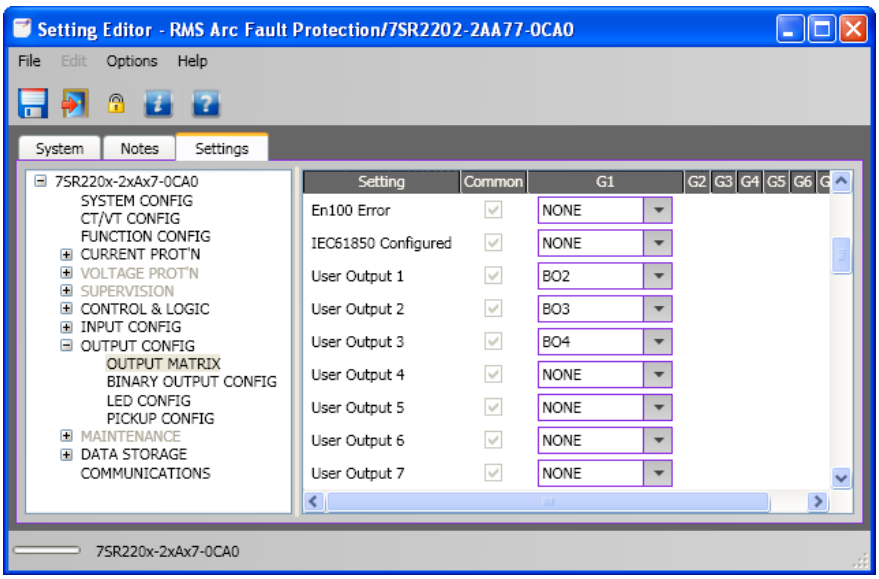


Binary Output Allocation For Circuit Breaker Tripping

The following User Output to Binary Output allocations complete our ARC Fault Trip with Current Check.

SARC Operation	Zone Coverage	User Output	Binary Output	Trip
SARC 1	Feeder Exit Termination Chamber	User Output 1	BO2	1A CB
SARC 2	Feeder CB Chamber	User Output 2	BO3	TR1 LT CB
SARC 3 or SARC 4	Bus	User Output 2	BO3	TR1 LT CB
SARC 5	Incomer CB Chamber	User Output 3	BO4	Upstream
SARC 6	Incomer Termination Chamber	User Output 3	BO4	Upstream

The screenshot shows the User Output to Binary Output allocation in the setting editor of Reydisp Manager.



Complete any other Protection settings otherwise required and save your setting.

Device Synchronization

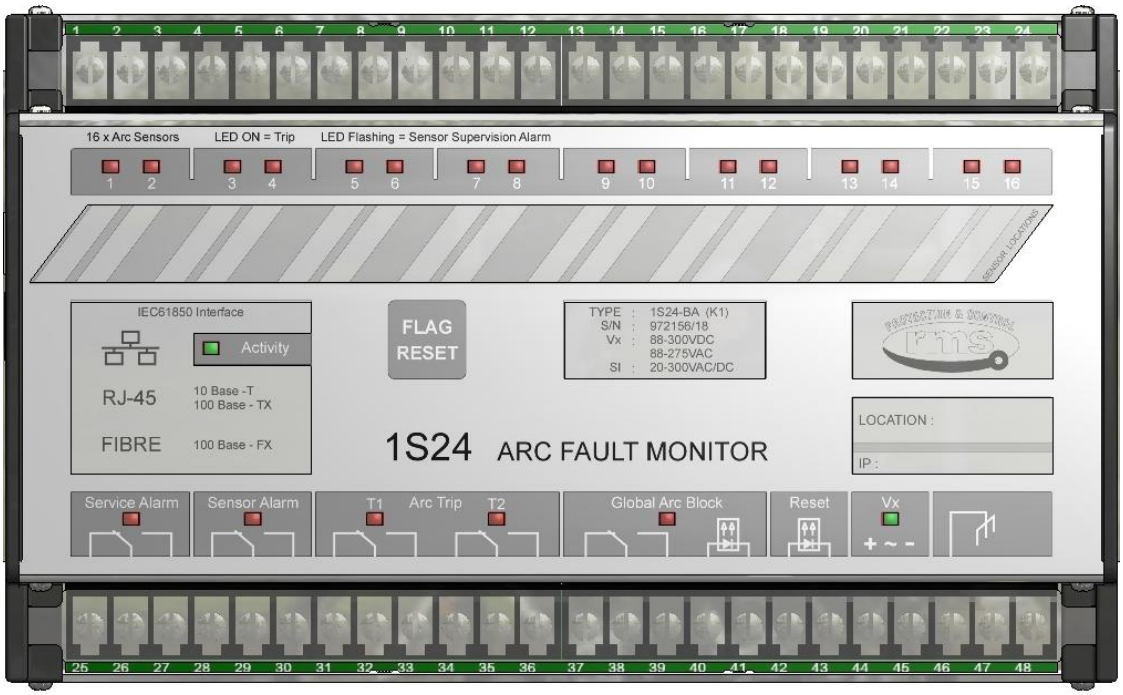
With all IED settings, IED Logic and IEC61850 configuration complete we now need to Synchronize the device.

Reydisp Manager will manage the file transfer process to the 7SR22 IED and upon completion the 7SR22 will be able subscribe to SARC Goose messages from the 1S24 IED.

Monitor Indications

Front Layout

The picture below depicts the indications provided on the front of the Arc Fault Monitor.



Power Up

When powering up, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 14 secs during the boot cycle.

When the boot cycle is complete the 1S24 will indicate the current state.

System Status

	Auxiliary Supply or Relay Healthy Indication **LED State** / **Meaning** On Solid — Healthy Fast Flashing (approx three times every sec) — CID loading error Slow Flashing (approx once every sec) — SNTP sync fail Off — Internal Communications failure Refer to the Commissioning section : Interpreting Vx Auxiliary Supply or Relay Healthy Indications for further details
	Ethernet Activity

Service Alarm

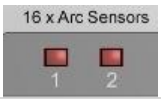
The module self supervision checks the following :

- Auxiliary supply failure
- Internal supply rail is outside acceptable limits
- CPU Hardware watchdog failure

	Service Alarm

Arc Sensor Indicators

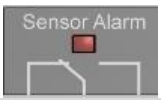
Indicate solid when an Arc Sensor has detected an Arc, the LEDs are reset after pressing the Flag Reset.

	16 Arc Sensor Indicators

A flashing Arc Sensor LED indicates a failure of the sensor, refer to the Sensor Alarm indicator description.

Arc Sensor Circuit Supervision

Indicates solid when an Arc Sensor has faulted either due to an open circuit, sustained short circuit (>10 sec) or high ambient lighting.

	Sensor Alarm

The affected sensor will be indicated by its front panel sensor LED 1-16 flashing.

The Sensor Alarm will self reset upon the fault conditions being corrected.

Arc Trip

Indicates solid when the respective assigned self reset Arc Trip contacts operate. The LEDs reset when the Arc Trip contacts self reset.

	Arc Trip

Global Arc Block

Indicates solid when the Global Arc Block input is energised, all Arc Trips are blocked (61850 and Arc Trip outputs).

	Global Arc Block

Flag Reset

	To reset the ARC Sensor LEDs
	The ARC sensor LEDs may also be reset by energising the binary input

Reboot

	A reboot is achieved by applying power to the relay, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 14 secs. Alternatively if the relay is powered, hold down the Flag Reset button for about 5 sec until all of the Leds (except Service) start flashing, then release the Flag Reset button. The LEDs will continue to flash for approx 9 secs and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes another 14 secs approx. The reboot must be used after loading in new .icd files into the IED and restarting the software process with the new 61850 configurations. The reboot may also be required if for some reason the 1S24 does not respond to web server commands or becomes unresponsive to ftp or terminal sessions.

Reset To Factory Default

	With the relay unpowered, hold down the Flag Reset button and power up the relay. After releasing the reset button all of the Leds (except Service) will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes another 14 secs approx. The Cold Boot is used for reverting the IED back to factory default settings including default passwords.

Commissioning

Commissioning Preliminaries

Carefully examine the module to ensure that no damage has occurred during transit. Check that the model number and rating information are correct.

Insulation

The relay, and its associated wiring, may be insulation tested between:

- all electrically isolated circuits
- all circuits and earth

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1000V. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests, subsequently must be replaced.

ARC Trip Verification

ARC Trip Verification will require a flash source to initiate sensor operation.

A high powered photographic flash is the most convenient means of initiating positive sensor operation.

Note that mobile phone or small compact camera flashes may not have sufficient power to cause sensor operation.

The RMS 'Arc Flash Timing Test Guide' outlines a suggested test setup to provide a flash source and determine ARC Trip times. The 'Arc Flash Timing Test Guide' is available on the RMS website:

www.rmspl.com.au/userguide/arc_flash_timing_test_guide.pdf

Arc only tests are conducted as per the section ‘Timing test of 1S25 (no current check)’ substituting the wiring for the 1S25 with equivalent wiring for the 1S24.

Current check tests are conducted as per the section ‘Timing test of 1S26’, with the 1S30 connected to the 1S24, the current source connected to the current check relay and the 1S24 and subscribing current check relay connected via a IEC61850 Station Bus Lan for the transfer of Goose messages.

The ‘Arc Flash Timing Test Guide’ only requires the use of a conventional test set, end users may also find it beneficial to have access to a IEC61850 equipped test set which can aid in the observation of GOOSE traffic, undertaking GOOSE timing tests and trouble shooting.

Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

The following tests are undertaken following the completion of all 1S24 ARC Monitor and Overcurrent Relay IEC61850 Substation Configuration and associated IED configurations, scheme wiring and the wiring of all 1S30 sensors.

System Power Up

Item	Description	Complete
1	Confirm all necessary primary equipment isolations	
2	Confirm all necessary secondary equipment isolations (including trip outputs)	
3	Check fitment of 1S30 optical sensors and cable condition	
4	Check panel installation of the 1S24 monitor	
5	Check for correct case earthing	
6	Check the 1S24 is wired to the protection design schematic, connected to a Substation LAN and confirm all IEC61850 configurations	
7	Confirm Fail alarm relay is closed (Terminals 25 and 26)	
8	Apply correct Auxiliary voltage to power up the 1S24	
9	Upon power up the relay enters a relay boot cycle, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 14 secs. Observe that the green power LED remains illuminated solid after the relay boot cycle.	
10	Confirm Fail alarm relay is open (Terminals 25 and 26) and the associated LED is extinguished	
11	Using a web browser check 1S24 configuration settings match protection setting specifications	
12	Confirm that the Arc Sensor fail alarm LED remains off and none of the sensor LEDs are flashing (Refer Sensor Failure Trouble shooting if a sensor fail is indicated)	
13	Confirm all Sensor LED's remain OFF	
14	Confirm the Ethernet LED is showing activity	

Sensor Failure Alarm Verification

Item	Description	Complete
1	Disconnect each sensor from the associated 1S24 sensor input	
2	Confirm the associated sensor LED flashes, the Sensor Alarm LED illuminates and operation of the Relay Fail Alarm output contact	
3	Reconnect each sensor back to the associated 1S24 sensor input	
4	Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens	
5	In turn short across each 1S24 sensor input	
6	Confirm the associated sensor LED flashes, the Sensor Alarm LED illuminates and operation of the Relay Fail Alarm output contact	
7	Remove the short on each 1S24 sensor input	
8	Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens	

Arc Trip Testing

Item	Description	Complete
1	Initiate the operation of each sensor by the use of a suitably powered camera flash * If a current check interlock is employed in your ARC Fault protection scheme ensure that current is injected into the associated Overcurrent relay to cause operation of the current check element at the same time the sensor is flashed	
2	Check operation of the corresponding sensor LED and the arc fault trip output contacts	
3	Confirm that the subscribing IED has received the GOOSE SARC from the 1S24	
4	View the web browser settings of the 1S24 to explain any unexpected behavior	
5	Confirm operation of Flag Reset after each tripping operation. Repeat ARC trips and confirm correct operation of remote reset using the web browser	

Refer also to the RMS 'Arc Flash Timing Test Guide' for a suggested test setup to provide a flash source and determine ARC Trip times. The 'Arc Flash Timing Test Guide' is available on the RMS website :

www.rmspl.com.au/userguide/arc_flash_timing_test_guide.pdf

Apply a Global ARC Fault block.

Item	Description	Complete
1	Initiate the operation of each sensor by the use of a suitably powered camera flash	
2	Confirm blocking of the arc fault trip output contacts	
3	Confirm blocking of the SARC GOOSE messages from the 1S24	

Sensor Failure Alarm Trouble Shooting

Item	Description	Complete
1	If any arc sensor LED's are flashing re-check the 1S30 wiring integrity	
2	Check that the sensors are wired to the correct sensor inputs	
3	Using a web browser session check that the correct sensor inputs are enabled and any unused sensor inputs are disabled	
4	If the Sensor Alarm persists disable all of the sensor inputs and check that all Sensor Alarm indications are extinguished	

ARC Sensor Supervision Trouble Shooting

Item	Description	Complete
1	If there is a Sensor Alarm indication re-check the 1S30 wiring integrity	
2	Check that the sensors are connected to the correct arc sensor inputs and check that the correct sensor inputs are enabled and unused inputs are disabled	
3	Check for high ambient lighting conditions for all the sensors	

ARC Trip Trouble Shooting

If an arc trip occurs without an ARC being present this indicates either:

- a very high ambient light condition is triggering a sensor

or

- short circuit wiring of a 1S30 sensor

In both cases if the condition persists the Supervision output will operate after a 10 sec delay.

Item	Description	Complete
1	Check the 1S30 wiring integrity of the sensors	
2	Check for high ambient lighting conditions for all the sensors	

General Ethernet Communications Trouble Shooting

If you are having trouble communicating with the 1S24 IED or other subscribing IEDs check the following:

Item	Description	Complete
1	Check that the Station Bus Lan is active and functioning	
2	Check that the 1S24 IED and the subscribing IED Ethernet ports are active and communicating by checking the port activity LEDs	
3	Undertake a ping test on the 1S24 IED and the subscribing IEDs	
4	Confirm the IP addressing for each of the devices is correct as determined by the Substation topology (check the devices are on the same Subnet) and that devices connected on the same Subnet have unique addresses	

IEC61850 GOOSE Message Trouble Shooting

If a SARC GOOSE is not being received by a subscribing IED check the following:

Item	Description	Complete
1	Check that the required SARC is enabled in the 1S24	
2	For a current check scheme is the current check element enabled and being picked up?	
3	Check the GOOSE linkages in the Substation Project and ensure that the correct sources and subscriptions have been established	
4	Check that the Subscribing IED logic is consistent with the Subscribed SARC. If required troubleshoot the logic by observing the individual incoming signals are consistent with your test conditions for example • Is the correct GGIO being received? • Is the quality bit being correctly treated? • Is the current check qualification being asserted	
5	Using the 1S24 Web Browser check for any error messages on the Status screen when you FTP the .cid file into the device	
6	In the Web Browser observe the trip status when a Sensor is triggered	
7	Using and IEC61850 browser such as IED Scout observe the trip status changes in the 1S24 ICD	

Interpreting Vx Auxiliary Supply or Relay Healthy Indications

The Healthy LED will be illuminated solid to indicate normal operation of the 1S24.

The Healthy LED is also utilised to indicate error conditions to assist in troubleshooting.

The following table summarises all Healthy LED indications :

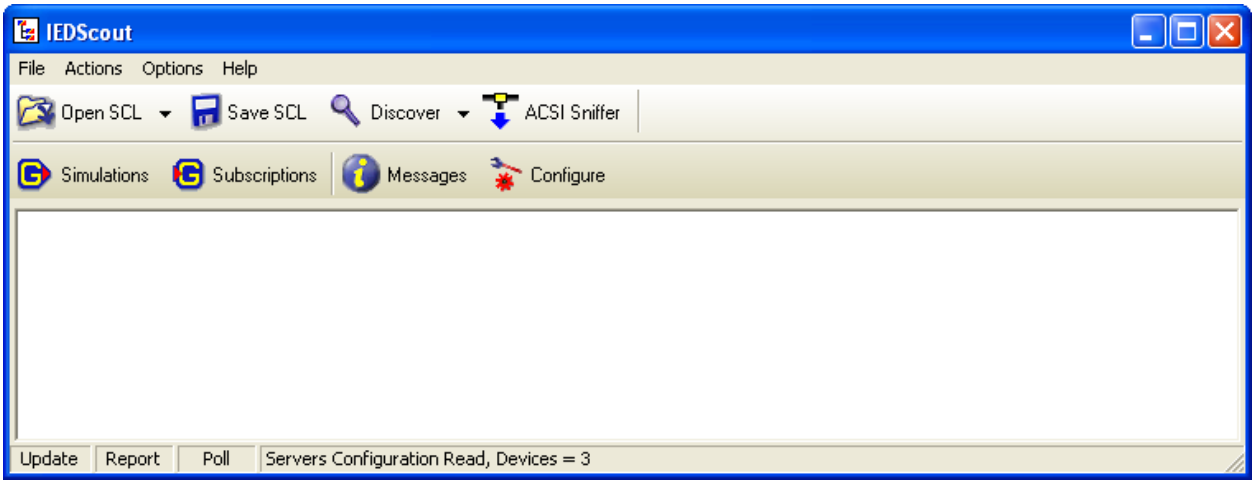
LED State	**Meaning**
On Solid	Healthy
Fast Flashing (approx three times every sec)	CID loading error (61850 stack problem) The .cid file is in error or possibly corrupted, open a web server session where further information is reported on the Relay Build page
Slow Flashing (approx once every sec)	SNTP sync fail Check SNTP server is functioning or check that the SNTP Server address on the IP config screen is correct
Off	Internal 1S24 Communications failure A permanent Internal 1S24 Communications failure will assert the Service Alarm

Using IED SCOUT IEC61850 GOOSE Message Trouble Shooting

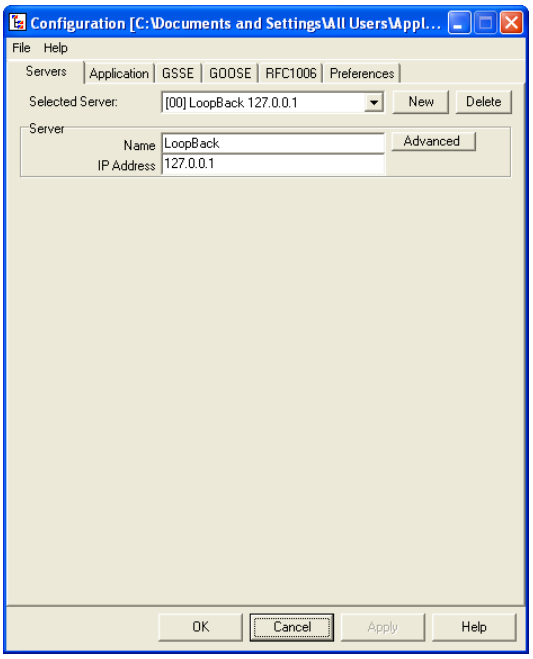
Status changes of the 1S24 ICD may be independently observed in more depth by using an IEC61850 browser such as IED Scout.

A free limited functionality version of IED Scout may be downloaded from the OMICRON website.

To view a 1S24 on a network start up IED Scout.



Go to Options and Configuration.



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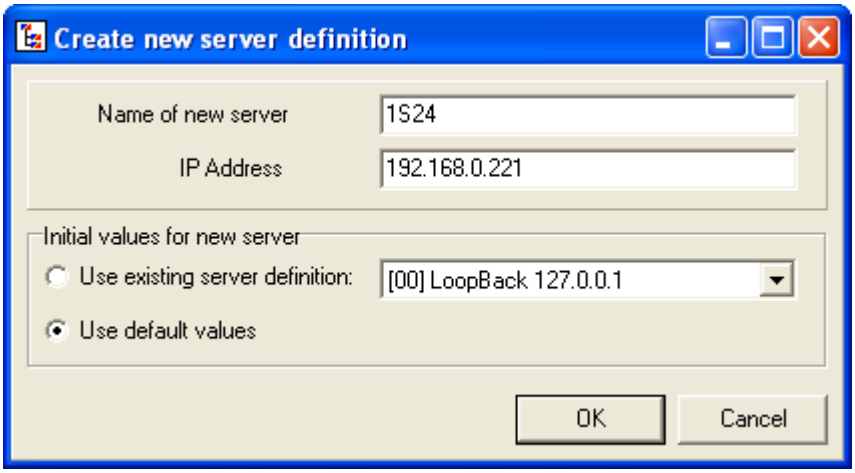
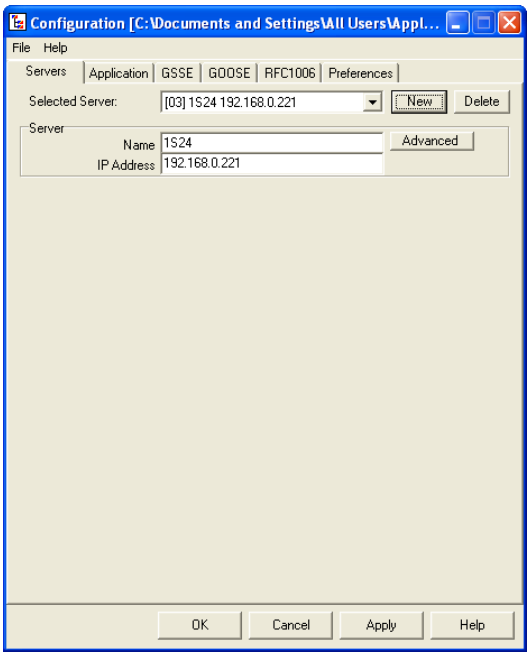
Due to RMS continuous product improvement policy this information is subject to change without notice. 1S24_Guide/Iss B/23/07/12

In the Servers tab press the New button.



Enter the name of the 1S24 and the IP address and hit OK.

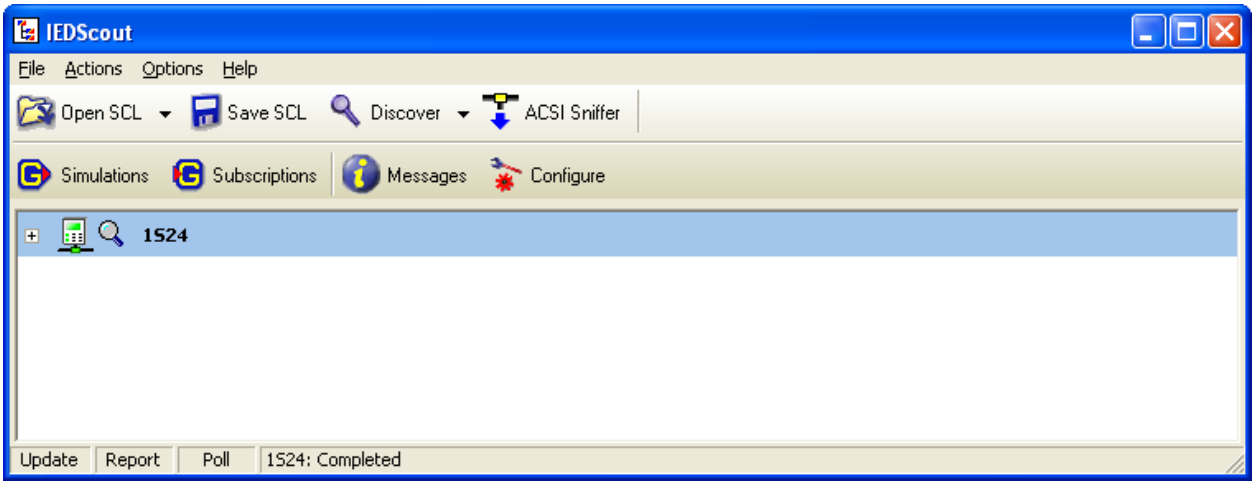


At the Servers Tab press the OK botton again.

Then at the main screen press the Discover button and choose the server you've just created and then Connect.

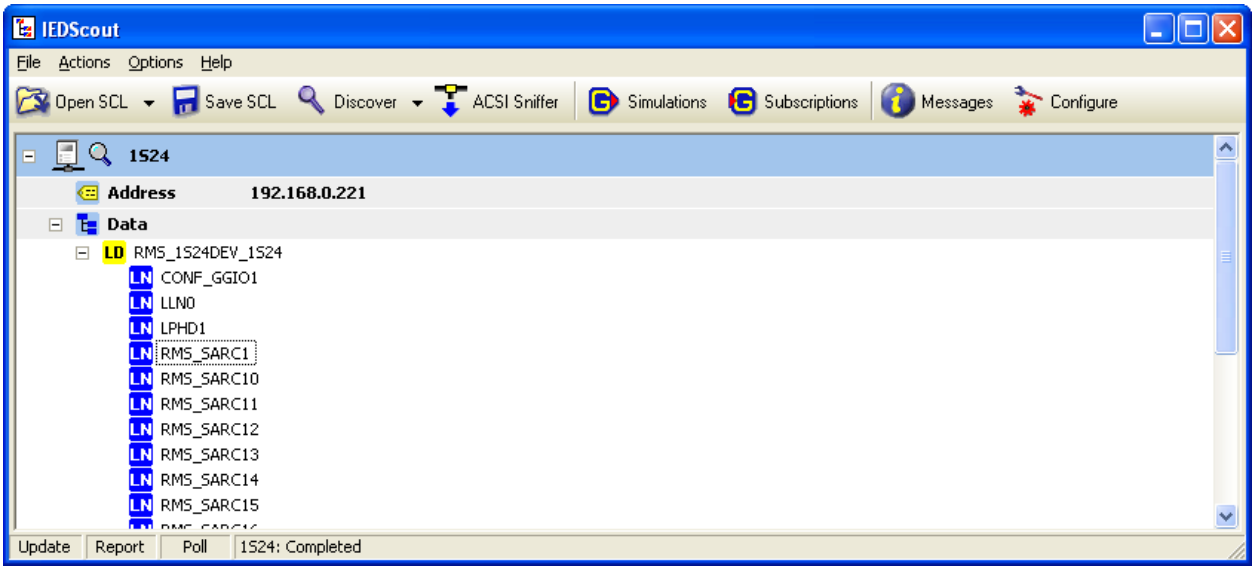
Visit *www.rmspl.com.au* for the latest product information.Page
Due to RMS continuous product improvement policy this information is subject to change without notice. 1S24_Guide/Iss B/23/07/12

You will now see that the 1S24 is available for viewing.



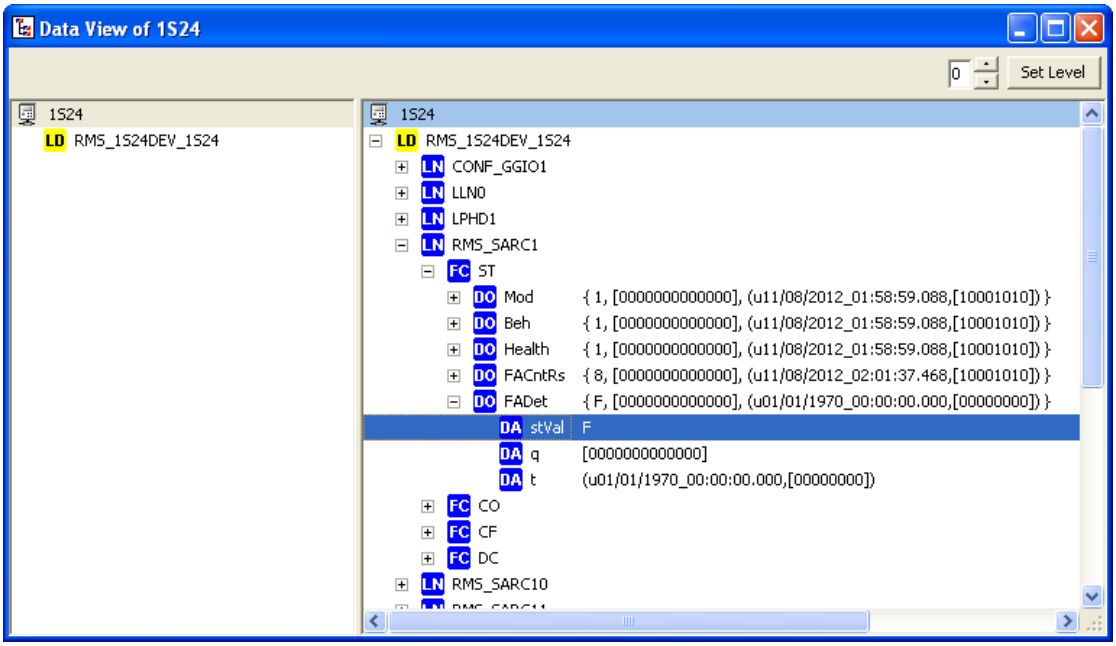
You can drill down in the Logical Node structure of the 1S24.

To view the Data for SARC1 double click RMS_SARC1

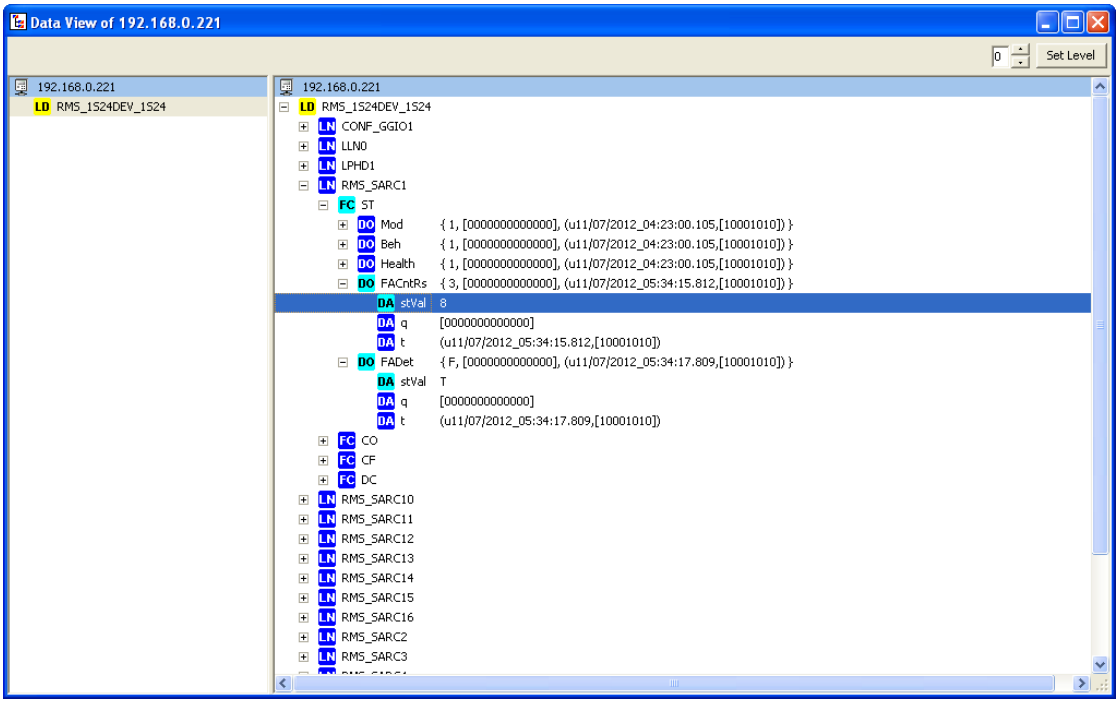


And then further drill down in to the status data for example to view the status of FADet.

In the untripped state the stVal will show as F (false)



In the 2 second window of a trip the FADet status will show as T (true)



The counter will also increment with each trip.